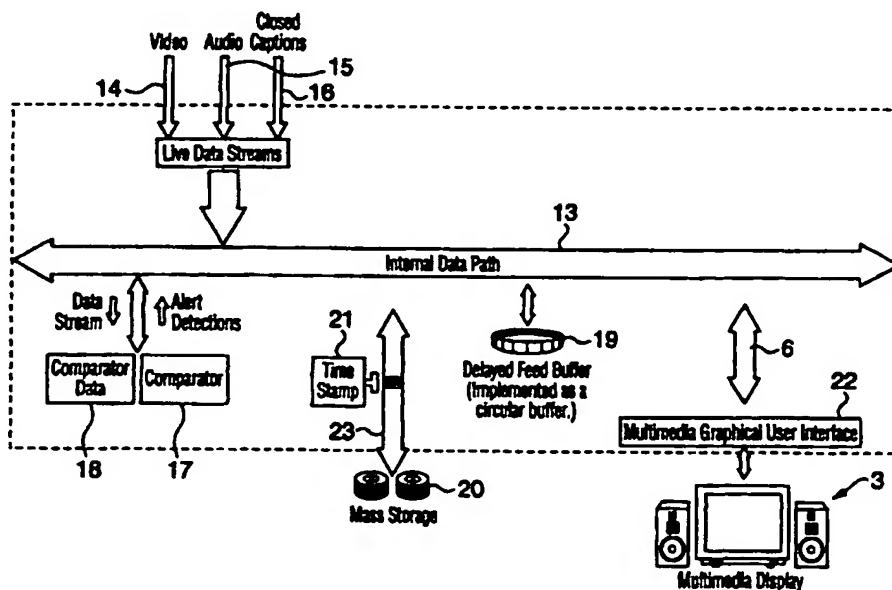




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(54) Title: AUTOMATIC BROADCAST MONITORING SYSTEM



## (57) Abstract

A system for monitoring standard broadcast signals, comprises a device for receiving the broadcast signals, a user-operable selection device for inputting criteria identifying program content of interest to the user, a database for storing data representing the criteria, and a recognition device for generating from the broadcast signals a program data stream representative of the program content. A comparator compares the program data with the stored data, and an output device carries out a predetermined action, such recording a segment of the program, when the program data matches the stored data. The system will, for example, activate a window on a multimedia PC when preselected program material is present in the broadcast signals.

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## AUTOMATIC BROADCAST MONITORING SYSTEM

This invention relates to a system for automatically monitoring broadcasts, such as television broadcasts, and detecting content of particular interest to individual viewers.

Many organizations, for example, stock brokerage services, have an on-going need to monitor world events. It is known for such organizations to retain media and news scanning services that employ people to watch television to look for particular topics of interest. These services log occurrences of particular items and either advise their customers by telephone or provide reports that may include video clips that they manually put together. For example, the service might continuously record a particular television channel while someone watches it. The person watching will record in a log the occurrences of interest, noting the time and tape position. The recorded tapes will later be searched using the time or tape position from the logs. Edited clips are then put together in a time consuming manual process.

The shortcomings with this method are many. The response time in noticing an event of interest is slow, typically minutes. Many hours may pass before the interested party is informed of the event. The cost of paying people to watch television is high. For example, at \$10 per hour, twelve hours per day, the cost works out at \$43,800 per channel per year. Looking up individual video clips is very slow and requires knowledgeable staff because the look-up is keyed to time of occurrence rather than words or phrases. Typical tape fast forwards or rewinds take three to five minutes each. The approach is also inflexible in that any new search on recorded video requires people to

watch it all over again, thus incurring the entire overhead again.

Other solutions include raw television capture devices for computers. These capture devices convert the television video to digital format for storage and distribution on computer networks. These products capture the raw footage, but are not in any way dependent on content. They may capture and distribute video, and/or audio, and/or caption text, but they do not alert users to particular topics immediately as they occur on television broadcasts.

Another solution uses a technique called datacasting. With this technique, the broadcaster injects data into the vertical blanking interval (VBI) of the video television a signal that contains information about the program. The data is created by the broadcaster, or source program author. The data usually contains titles, summaries, and other information related to the program. This information can be used by the user to select items of interest. The disadvantage to this approach is that it requires special information to be created at the source and transmitted from the source. It also requires special proprietary hardware to receive the data, and more significantly still requires the user to continually monitor the datacast information. This VBI data injection approach has another major shortcoming in that very few, if any broadcast stations use this technique, and those that do encode it so that special equipment is required to decode it. CNN at Work, sold by Intel is an example of such a product.

An object of the invention is to alleviate the aforementioned disadvantage of the prior art.

#### SUMMARY OF THE INVENTION

According to the present invention there is provided a system for monitoring broadcast signals, comprising: means



for receiving the broadcast signals and generating program signals to make available programs carried by said broadcast signals; user-operable selection means for inputting criteria identifying program content of interest to a user; a database for storing data representing said criteria; recognition means for generating from said broadcast signals a program data stream separate from said program signals and representative of program content; a comparator for comparing said program data stream with said stored data; and an output device operable to carry out a predetermined action when said program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The broadcast signals can be any type of signals carrying programs and distributed over a suitable transmission medium, wireless, cable or satellite. In one embodiment, the broadcast signals are television signals (although radio signals can in some cases be used if they are accompanied by program data, as is sometimes the case). They may also be television signals distributed digitally, for example, using the MPEG format.

In the case of television signals, the recognition means can monitor the closed caption text normally transmitted with the signals. Upon detection of certain words or phrases, the system generates an alarm condition to alert the user to the presence of such program content. For instance, in the case of a standard television set, a simple system could just turn up the volume so as to allow the user to hear the audio. In a more sophisticated system, the signals are stored and tagged for subsequent retrieval using database searching techniques.

The predetermined action can be any form of action that permits the user to examine the portion of the program of

interest. For example, it can involve recording the program signals and data signals for later review, activating a video window in a computer, or just activating a beeper to alert the user to the broadcast of program content of interest. For example, a message could be sent to a beeper advising the user that "Clinton is on television now", thus enabling him to watch the program on the nearest television set.

In another embodiment voice or pattern recognition techniques can be employed to monitor the audio or video directly.

Thus, with the system according to the invention, users can be automatically alerted to events as they happen. Video, audio and closed captions from television broadcasts can be automatically indexed and stored so they can be retrieved later in whole or in part, using *ad hoc* queries. Users can retrieve individual clips of video, audio or closed caption text by specifying content, for example by searching for a key word or phrase in addition to the traditional time/position based queries.

The invention is thus capable of automatic detection of content in television broadcasts using computers, synchronizing and capturing the incoming closed captioned text together with the video and audio in a computer environment, and indexing and retrieval of individual sections of video and audio based on the content of, for example, closed caption text.

The invention is applicable to the field of multimedia applications generally. It provides techniques for automatically creating indexed multimedia databases and has many applications. For example, government elected representatives and their assistants can monitor television programs to determine what is being said about them, about

their policies, etc. They can be alerted to issues immediately.

Regulated or government organizations can use this invention to monitor television programs for negative (or positive) views on their organizations. They can know about problems reported in the media and react sooner. They can track the media reaction to their policies.

Marketing departments can use this invention to collect information on competitors, customers of the organizations that employ them. They can be alerted to issues immediately. As well, marketing multimedia databases can be built automatically.

Broadcast industry, cable carriers and telephone companies can use this system to create and maintain multimedia databases. Cable Companies and Telco's can use this invention to provide differentiated services to their customers, for example filtering and querying capability on live broadcasts and also on multimedia databases.

Individuals can use this technology to minimize time spent watching television. Items not of interest can be filtered out. Program transcripts can be captured and perused with only the desired video and audio being played back.

The invention also provides other multimedia applications and databases with access to fully indexed video, audio and closed captions from broadcast television.

The invention also provides a multimedia computer system, comprising: a central processing unit; a video capture unit for receiving broadcast television signals and generating a video signal therefrom; a video display unit capable of displaying said video signals under program control; means for decoding data signals embedded in said

television signals and generating a program data stream representative of program content of said television signals; means for inputting criteria identifying program content of interest to a user; and a database for storing data representing said criteria. The central processing unit is programmed to continually compare the program data with said stored data and carry out a predetermined action when said program data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The invention still further provides a method of monitoring broadcast signals, comprising the steps of: extracting program signals from said broadcast signals; generating from the broadcast signals a program data stream separate from said program signals and representative of program content; comparing said program data stream with stored data identifying program content of interest to the user; and generating an output condition when said generated program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The invention additionally provides a computer-readable storage medium having binary information encoded thereon, said binary information being operable when interpreted by a computer to direct the computer to monitor broadcast signals and generate program signals to permit the presentation of program material carried by the broadcast signals to a user, analyze incoming broadcast signals to generate a program data stream separate from said program signals and representative of their program content, compare said data stream with stored data identifying program content of interest, and generate an output condition when said generated data matches said stored data to permit the user

to examine a portion of a monitored program associated with said matching program data stream.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a block diagram of a system in accordance with the invention showing the overall system architecture;

Figure 2 is a block diagram showing the internal architecture of the system shown in Figure 1;

Figure 3 is a flow chart showing the closed caption stream processing;

Figure 4 is a flow chart showing audio stream processing;

Figure 5 is a flow chart showing video stream processing;

Figure 6 is a flow chart showing the alert handling procedure; and

Figure 7 is a flow chart showing the stored data processing;

Figure 8 is an embodiment of the invention based on a standard stand-alone multimedia personal computer;

Figure 9 is a functional block diagram of a live feed arrangement for the embodiment shown in Figure 8;

Figure 10 is a functional block diagram of a network feed arrangement;

Figure 11 is a functional block diagram of an arrangement for playing back or re-recording a video segment;

Figure 12 shows a typical display screen;

Figure 13 shows a typical display screen showing a program listing; and

Figure 14 is a block diagram of another embodiment of the invention applicable to an on-demand architecture.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figure 1, a monitoring system 1 in accordance with the invention receives a standard broadcast television signal from a tuner 2. The system is connected over a bi-directional link 6 to a multimedia display 3 consisting of a personal computer including a CRT monitor 4 and speakers 5. The multimedia display can form part of a conventional multimedia PC set-up. The system 1 can also be connected to a network 7, which in turn is connected to individual workstations 8.

The monitoring system 1 comprises a video capture unit 9, a closed caption capture unit 10, and an audio capture unit 11. Such units are *per se* commercially available. Data streams 14, 15, 16, which are preferably digital although they could be analogue, from these units are passed to bus 13 of unit 12, shown in more detail in Figure 2. Unit 12 carries out several functions as follows:

- Video, audio and closed Caption data streams are synchronized and tagged for time of arrival.
- Users are alerted to program content by continuous checking of the closed caption text stream.
- Video, audio and closed captions are saved to disk storage. The video and audio clips can be retrieved by word or phrase using the closed captioned text and the synchronizing tags that index the video and audio. The Video, audio and closed caption text might be saved to disk continuously but the recording of the data can also be based on content.

For example, the system might be instructed to start recording video, audio and closed caption data from 30 seconds before (using a delayed feed buffer) to 5 minutes after the appearance of a keyword in the closed caption stream. This is significant since continuous storage of video data imposes huge storage requirements.

- Clients on the network 7 can receive alerts, multimedia feeds and perform queries as shown on the multimedia display above.

In operation, the user enters data either through, for example, a LAN-connected PC 8 or the workstation 3. For example, the user might enter a series of key words representing topics of interest. These key words are then entered into a profile database in mass storage device 20 along with the identity of the user. When the selected key words appear in the closed caption data stream, the system generates an alert signal to alert the user. For example, the system might be set to trigger an alert if the words CLINTON and YELTSIN occur within an adjacent stream of twenty words. In a simple case, the alert may, for example, involve turning up the sound on the monitor 4. If desired, the system can also employ fuzzy logic principles to find similar words, for example, synonyms of the words entered by the user. This arrangement also copes with mis-spellings, which are quite common in closed caption systems.

Each user connected to the system can of course enter his or her own customized search profile.

Referring now to Figure 2, when the system is monitoring the broadcast signals, the incoming data streams 14, 15, 16 are passed over internal bus 13 to comparator 17, which compares the data with comparison data stored in a profile database 18 set-up by the user in mass storage unit

20. Database 18 stores the data entered by the user through the multimedia PC 3. For example, the user may have chosen a set of keywords and phrases to look for in the closed caption data stream. These are entered through multimedia PC 3 and stored in the database 18.

The incoming data streams, or as noted above selected portions of them, are stored in mass storage device 20 along with a time stamp added by time stamp unit 21. Storage device 18 may be analogue, although it is preferably digital to allow random access to the information.

Through PC 3, the user can also set up other actions for the system to perform when a keyword or phrase is found. These actions include sounding a beep, activating a remote beeper, opening a video window, sending electronic mail - essentially any action the computer can be programmed to perform. Also the system can automatically create a profile, (or comparator database), from an existing database, spreadsheet or word processor file, that can be used for monitoring. The system creates this profile by searching the specified files for proper nouns, categories and pre-defined keywords. After retrieving these from the specified file, they are presented to the user for modification.

Each user 8 on the network can also add, delete, and modify the database profile 18 over the network 7 to customize it for his individual requirements.

When system is storing data, the closed captioned text is stored in a standard text database in the mass storage unit 20. There are at least two columns in the database, namely the captured phrase and the absolute time it was captured. The audio stream and video streams are also captured together with their absolute start time. Individual sections of video and audio can be retrieved using SQL-like queries on the closed captioned text. The associated video



and audio are retrieved using absolute time returned from the text query. The system will position to the exact time within the video and audio that the word or phrase occurs at.

The system also has a delayed feed buffer 19, implemented as a circular buffer. This stores that last n minutes of each of the data streams. The user can specify the length of this buffer and each of the three data streams can have different lengths. This buffer 19 also provides the user with the ability to backup a few seconds or minutes when an alert is received. Using technology known *per se*, the delayed feed buffer can also be played back at double speed so that the user can catch up to the live broadcast.

The system provides the ability to distribute video, audio and text in whole or in part. Lower speed systems may choose only to receive the closed captioned text of a program, or just the audio.

A specific example of the use of the monitoring system is as follows: A television viewer wants to watch the movie "Gone With The Wind". The viewer sets the computer to beep when the words "I don't give a damn" are spoken. Alternatively, having stored the same movie with this technology, they could position directly to the scene where those words are spoken, without having to know where in the movie, by time or relative position, these words occur. The user interface for positioning to the words or phrases of interest is very similar to a word or phrase search in a word processor, or an SQL query.

The system in the embodiment described monitors the incoming closed captioned text stream, synchronizes it with the incoming video and audio, and alerts the user to topics of interest. When an alert happens, programmable actions, such as sounding a beep and/or bringing up a video window,

occur. The incoming video, audio and closed caption text are stored with time based tags and indexes, creating a fully indexed multimedia database automatically.

Users have an SQL-like query capability on closed caption text with an ability to retrieve associated portions of video and audio. They can configure the monitoring software for particular words, phrases or general content, and perform particular actions upon alerts.

The video, audio and closed captioned text can be distributed on the computer network 7, either directly or through electronic mail. The system and network managers can be provided with an ability to manage the system and network resource usage.

Figure 3 shows the processing of the embedded data stream, which in this embodiment constitutes the closed caption stream. The text is first acquired in unit 110 and after insertion of a time-stamp in unit 111 inserted into the delayed feed buffer 19, after which is compared to comparator 113 for comparison with words from the user profile stored in storage unit 20. If a match is found, decision unit 114 activates alert handling unit 115 (shown in more detail in Figure 6).

In the absence of a match, decision unit 116 determines whether the closed caption text is to be recorded in accordance with user instructions. If yes, the closed caption text is written to file in unit 117; if not, unit 118 determined whether the text is to be displayed in closed caption display 119.

Figure 4 is a flow chart similar to Figure 3 for pattern matching based on audio, which is treated separately from the video. Audio units 210 to 219 operate in a similar manner to units 110 to 119 in Figure 3 except for the fact

that the pattern matching is achieved by extracting text from the audio stream using voice recognition techniques.

Figure 5 is a flow chart similar to Figure 3 for pattern matching based on video, which is treated separately from the audio. Video units 310 to 319 operate in a similar manner to units 110 to 119 in Figure 3 except for the fact that the pattern matching is achieved by extracting text from the video stream using pattern recognition techniques or by analyzing color histograms, for example.

Figure 6 shows how alerts are handled. When an alert occurs as a result of a pattern match, unit 410 identifies the alert type. If an audible alert has been requested, decision unit 411 sounds bell 412.

Decision unit 413 determines whether a recording has been requested, and if so causes unit 414 to write video, audio, and closed caption data from delayed feed buffer 19 to be written to a file on mass storage unit 20. Unit 415 causes the recording of incoming video, audio, and closed caption data to be commenced.

Decision unit 416 determines whether a display has been requested, and if so unit 417 causes unit 418 to start displaying the video, audio and closed caption data.

Figure 7 illustrates the stored data handling. One or more keywords are first requested from the user by unit 510. The user enters the keywords through the computer keyboard.

Unit 511 searches the closed caption file for matching keywords and unit 512 displays a list of matching segments. Unit 513 requests a user selection. Decision unit 514 returns control to the request unit 510 if no selection is made; otherwise unit 515 locates the matching segment, which is then displayed by unit 516.

A system in accordance with the invention can conveniently be implemented as a stand-alone system on a personal computer running a Windows™ operating system as shown in Figure 8. Personal computer 30 includes at least a 486 DX66 and preferably a 90MHz Pentium or higher microprocessor 31 on the motherboard and a hard drive 32 with preferably at least one gigabyte of storage space connected to PC bus 35. A Creative Labs Video Blaster™ video capture card 33 is located in one of the expansion slots of the motherboard. A suitable 16-bit sound card 34, such as a Soundblaster™, is located in a second expansion slot. The personal computer 30 is connected to a conventional video display unit 28 and keyboard 29.

The video card 33 and sound card 34 send respective compressed video packets 35 and audio packets 36 to the PC bus 35.

Incoming rf television signals 37 from a cable or antenna source 38 are fed to a cable converter or VCR which demodulates the incoming rf signals and generates an audio stream 40, which is fed to the sound card 34, and a video stream 41, which is fed to the video card 33.

The video signals 41 are also fed to a Sunbelt TextGrabber™ closed caption decoder 42. This decodes the closed caption signals embedded in the vertical blanking interval and sends an ASCII text stream to the PC bus 35 through the serial port 44 and UART 45, which created text packets 46.

The user enters instructions through the keyboard 29 with the assistance of dialog boxes and a mouse (not shown) in a customary manner.

Figure 9 shows in more detail the processing of the signals in the personal computer 30. The video signals are

passed through rate controller 50, which measures the frame rate in accordance with user instructions, to video delay unit 51. The audio signals are passed directly from audio capture unit 34 to audio delay unit 52. The closed caption signals are passed through closed caption pattern matching unit 53, which looks for pattern matches with the stored data representing the selected criteria, and closed caption display unit 54 to closed caption delay unit 55. Caption pattern unit 53 can carry out pattern matches on the basis of Boolean combinations of keywords entered by the user through the keyboard 29. For example, the pattern matching circuit 53 might trigger an event if two selected words occur within a stream of twenty adjacent words. The closed caption display unit 54 permits the user to view the closed caption text directly in a window on the video display unit 28 under program control.

The delay units 51, 52, 55 serve as buffers that hold the respective incoming signals for a time that can be selected by the user, for example 10 seconds or 20 seconds. This allows the user to either replay a portion of program material that has just been broadcast or to arrange for the computer to store not only a predefined segment of program material after detection of a pattern match, but also a segment prior to finding a match. For example, a typical set-up may be to store the previous ten seconds and the following twenty seconds after a pattern match. Each delay unit 51, 52, 55 has three output ports a, b, c.

The video delay unit 51, audio delay unit 52, and closed caption delay unit 55 are connected through port b to a network interface 56 for the distribution of captured material over a network, such as a local area network.

The above units are also each connected through port c to a synchronizing unit 57, an audio synchronizing unit 58

and a closed caption synchronizing unit 59. These three units 57, 58, 59 create an AVI (Audio-Video interleaved) file 60 on hard disk 32, which contains a video clip consisting of video, audio and associated closed caption data.

The units 51, 52, and 55 are also connected through port a to additional synchronizing units 61, 62, 63 connected respectively to a video display generator 64, a sound generator 65 in audio card 34, and a closed caption display generator 66. The video and closed captioning thus appear in a window, with the video (and audio) synchronized to the closed captioning.

When a pattern match is detected by the unit 53, a signal 68 is sent to the record callback unit 67. This causes one or more of several predetermined actions to take place depending on the mode selected by the user. The record callback unit activates ports a, b or c of delay units 51, 52, 55 to cause the delayed feed to be sent to the live display through units 61, 62, 63, the network 56, or the AVI file 60 through units 57, 58, 59. Instead of being stored in a computer file, the video and audio (and possibly closed caption stream) could be stored on a VCR tape. The ports can access the buffered signals at any time point in the buffers depending on the user setting.

Figure 10 shows an arrangement where the computer receives a feed from a local area network (LAN). In this case the incoming broadcast signals are received by a network server, digitized and transmitted to the clients on the network. The network provides signals equivalent to the capture units 33, 34, 42. The rest of the system remains the same. In this embodiment, only the server requires a video card and closed caption capture unit. The clients receive

the digitized signals, including video, sound, and closed captions over a network interface, such as SMC EtherEZ.

In Figure 11, an AVI file is received by unit 90 and the audio extracted in unit 95. The video is sent through video synchronizer 91, rate monitor 92 and video splitter 93 to video display 94 and output AVI file 97. The closed caption stream is sent through closed caption synchronizer 100, closed caption sink 99, which extracts closed caption text for continuous display, closed caption splitter 98, from where it is passed to closed caption display 96 and AVI output file 97. The units 94 and 96 allow the video to be displayed along with its associated closed caption text. The output file 97 allows the user to edit and re-record portions of the stored text.

Figure 12 shows a typical display screen running in an active window 70 on visual display unit 28. Video segment 71 is playing along with its associated audio. Beside the video segment 71 is the closed caption text 72. Pointer 73 indicates the portion of text related to the current image 71. The pointer 73 can be dragged up and down with the mouse to cause the video corresponding to the indicated text to be played.

Figure 13 shows a window displaying a listing of recorded video clips. Double clicking on any of the items listed causes the item to appear in an active window along with the associated text for playback, which can be initiated using a Windows™ style control bar.

The system can be programmed to watch multiple channels simultaneously. In this case each channel has its own processing system as described with reference to Figure 9.

In the embodiment of Figure 14, block 700 contains a monitoring system as described above and outputs digital signals for distribution over a remote network. This is

achieved by feeding the signals through satellite gateway 703 to satellite antenna 704, which sends them via satellite 705 to any one of a series of clients, such as 706. The clients 706 are connected back to the block 700 via the internet 707 or the public switched telephone network 708. The client 706 can use a service known as DirecPC, which provides a wide bandwidth downlink, for example, to the internet, with the uplink being provided through a conventional modem.

Unit 702 receives broadcast signals 701, for example from air or over a cable. These can be conventional analogue signals, or alternatively they can be digital signals, for example in MPEG format. The unit 702 receives instructions from client 706 over the network. When a pattern match is achieved, it send the program signals over the network to the client 706.

The system described in Figure 14 effectively acts as a network, with the unit 700 being the network server.

In a further enhancement, the client 706 is connected back to a media server 709, which permits access to "on-demand" channels. A second monitoring system 710 can be provided, if desired, both units 706 and 710 being controllable by the clients 706.

The described system thus has the advantage that it offers instant alert to events as they occur. Television feed can be automatically organized as it is stored; i.e., closed caption text is synchronized with the incoming video and audio. This provides the ability to automatically create a multimedia database from which items can be retrieved based on content, such as spoken words, and the ability to retrieve video and audio segments with word or phrase resolution. A stored video feed can be retrieved based on new information



The synchronized video, audio and closed captions can be distributed over computer networks.

The invention also offers a much lower cost due to the elimination of manual intervention, and a reduction of raw information flow, resulting in less network congestion.

We claim:

1. A system for monitoring broadcast signals, comprising:
  - a) means for receiving the broadcast signals and generating program signals to make available programs carried by said broadcast signals;
  - b) user-operable selection means for inputting criteria identifying program content of interest to a user;
  - c) a database for storing data representing said criteria;
  - d) recognition means for generating from said broadcast signals a program data stream separate from said program signals and representative of program content;
  - e) a comparator for comparing said program data stream with said stored data; and
  - f) an output device operable to carry out a predetermined action when said program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.
2. A system as claimed in claim 1, wherein said recognition means decodes data signals embedded in said broadcast signals to produce said program data stream.
3. A system as claimed in claim 2, wherein said embedded data signals comprise a closed caption text stream.
4. A system as claimed in claim 1, wherein said recognition means comprise audio recognition means for analyzing audio content of the broadcast signals.
5. A system as claimed in claim 1, wherein said recognition means comprise pattern recognition means for analyzing video content of the broadcast signals.
6. A system as claimed in any of claims 1 to 3, further comprising a mass storage device for storing said program

signals in response to a match of said program data stream and said stored data.

7. A system as claimed in claim 6, wherein said program signals are stored with their associated program data on said mass storage device.

8. A system as claimed in claim 6, wherein said program signals are indexed according to said program data.

9. A system as claimed in claim 6, further comprising video and audio capture devices for generating respective video and audio signals providing said program signals.

10. A system as claimed in claim 6, further comprising means for tagging the stored program signals with the time of broadcast.

11. A system as claimed in claim 1, wherein said output device generates an alert signal to alert the user to the presence of program content matching the user's selection criteria.

12. A system as claimed in claim 11, wherein said alert signal activates a video monitor.

13. A system as claimed in claim 12, wherein said video monitor is a television set.

14. A system as claimed in claim 12, wherein said video monitor forms part of a multimedia computer environment.

15. A system as claimed in claim 14, wherein said multimedia computer environment also provides said user-operable selection means.

16. A system as claimed in claim 6, further comprising a short-term buffer for storing said program signals for a predetermined period to permit access to program content for a preselected time prior to detection of a program content match .

17. A system as claimed in claim 1, which is connected to a computer network to permit clients thereon to individually perform queries and receive program signals from the system according to their respective program criteria.
18. A system as claimed in claim 11, wherein said output device transmits said alert signal to a remote location for reception by the user.
19. A system as claimed in claim 18, wherein said alert signal is a beeper signal.
20. A system as claimed in claim 1, wherein said broadcast signals include a plurality of channels, said recognition means generate a plurality of data streams corresponding to said respective channels, and said comparator continually compares said program data contained in said plurality of program data streams with said stored data so as to monitor simultaneously said plurality of channels.
21. A system as claimed in claim 1, wherein said database stores a plurality of predefined user profiles representing preselected criteria for respective users, and means are provided to activate any one of said predefined user profiles.
22. A system as claimed in claim 1, wherein said broadcast signals are television signals, and said recognition means generates said program data stream from signals transmitted in the vertical blanking interval between successive television frames.
23. A system as claimed in claim 1, wherein said broadcast signals are radio signals.
24. A system as claimed in claim 1, which is located in a network server, said network server sending said program signals over the network to clients located thereon in

response to a match between said program data stream and said stored data.

25. A system as claimed in claim 24, which is located in a network server, wherein said network server forms part of a local area network.

26. A system as claimed in claim 24, wherein said network server is located remotely from said clients and a long-distance communications link is established between said network server and said clients.

27. A multimedia computer system, comprising:

- a) a central processing unit;
- b) a video capture unit for receiving broadcast television signals and generating a video signal therefrom;
- c) a video display unit capable of displaying said video signals under program control;
- d) means for decoding data signals embedded in said television signals and generating a program data stream representative of program content of said television signals;
- e) means for inputting criteria identifying program content of interest to a user;
- f) a database for storing data representing said criteria; and

said central processing unit being programmed to continually compare the program data with said stored data and carry out a predetermined action when said program data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

28. A multimedia computer system as claimed in claim 27, wherein said data signals are embedded in the vertical blanking interval of said television signals.

29. A multimedia computer system as claimed in claim 28, wherein data signals are closed caption signals.

30. A multimedia computer system as claimed in claim 29, wherein said stored data represent one or more keywords selected by the user.

31. A multimedia computer system as claimed in claim 30, wherein said stored data represent a plurality of keywords, and said output condition is generated when said plurality of keywords are detected in said program data stream within a preselected period in accordance with predefined Boolean logic.

32. A multimedia computer system as claimed in claim 27, wherein said central processing unit is programmed to store a segment of said video signals in response to a match of said program data and said stored data, said segment being stored with associated program data.

33. A multimedia computer system as claimed in claim 32, wherein said segment has a length preset by the user.

34. A multimedia computer system as claimed in claim 33, further comprising a buffer for temporarily storing said video signals prior to comparison of the associated program data with said stored data, said computer being programmed to store a segment of said video signals for a period starting from a preselected amount of time prior to detection of a match of said program data and said stored data and finishing a preselected amount of time after a match of said program data and said stored data.

35. A multimedia computer system as claimed in claim 34, wherein said central processing unit stores multiple said segments indexed according to said program data.

36. A multimedia computer system as claimed in claim 27, wherein said computer system has an operating system

employing multiple windows, and said video signals appear in one or more of said multiple windows under program control.

37. A multimedia computer system as claimed in claim 36, wherein said video signals appear in one or more of said multiple windows in response to a match of said program data and said stored data.

38. A multimedia computer system as claimed in claim 36, wherein said central processing unit is programmed to display a listing of stored segments in one of said windows in response to a user command.

39. A multimedia computer system as claimed in claim 36, wherein text information derived from said program data stream is displayed in one of said windows.

40. A multimedia computer system as claimed in claim 39, wherein said displayed text information is synchronized with associated an associated video display.

41. A multimedia computer system as claimed in claim 40, wherein said computer is programmed to indicate text related to a displayed image.

42. A multimedia computer system as claimed in claim 41, wherein said computer is programmed to display video corresponding to text information pointed to by the user so that when the user points to a string of text the computer displays the video image associated with the text.

43. A multimedia computer system as claimed in claim 27, which forms part of a network server, said network server distributing program signals to clients on the network in response to said output condition or a user request.

44. A multimedia computer system as claimed in claim 43, wherein said network is a local area network.

45. A multimedia computer system as claimed in claim 43, wherein said clients are connected to said network server over long-distance communications links.
46. A method of monitoring broadcast signals, comprising the steps of:
- a) extracting program signals from said broadcast signals;
  - b) generating from the broadcast signals a program data stream separate from said program signals and representative of program content;
  - c) comparing said program data stream with stored data identifying program content of interest to the user; and
  - d) generating an output condition when said generated program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.
47. A method as claimed in claim 46, wherein said program data signals are extracted from signals embedded in said broadcast signals.
48. A method as claimed in claim 46, wherein said broadcast signals are television signals and said data signals are embedded in the vertical blanking interval thereof.
49. A method as claimed in claim 48, wherein said embedded data signals are closed caption signals.
50. A method as claimed in claim 46, wherein said output condition generates an alarm signal to alert the user to the presence of matching data.
51. A method as claimed in claim 46, wherein said output condition activates a video monitor to permit the user to watch the program material.
52. A method as claimed in claim 46, wherein said output condition causes program material contained in said



broadcast signals to be stored so as to permit the user to watch the program material at a later time.

53. A method as claimed in claim 52, wherein said program material is stored with its associated program data.

54. A method as claimed in claim 53, wherein said video monitor forms part of a multimedia computer system.

55. A method as claimed in claim 46, wherein said broadcast signals are received in digital format.

56. A method as claimed in claim 46, which takes place in a network server, and where said program signals are sent to clients on the network.

57. A method as claimed in claim 47, wherein said program signals are transmitted over a long-distance communications link to a remote said client in response to said output condition or a client request.

58. A computer-readable storage medium having binary information encoded thereon, said binary information being operable when interpreted by a computer to direct the computer to monitor broadcast signals and generate program signals to permit the presentation of program material carried by the broadcast signals to a user, analyze incoming broadcast signals to generate a program data stream separate from said program signals and representative of their program content, compare said data stream with stored data identifying program content of interest, and generate an output condition when said generated data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

59. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to

generate said data stream from data signals embedded in said broadcast signals.

60. A computer-readable storage medium as claimed in claim 59, wherein said broadcast signals are television signals and said binary information directs the computer to generate said data stream from data signals embedded in the vertical blanking interval between successive frames.

61. A computer-readable storage medium as claimed in claim 60, wherein said embedded data signals are closed caption signals.

62. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to generate an alarm signal to alert the user when said output condition occurs.

63. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to activate a video monitor to permit the user to watch program material carried by said broadcast signals when said output condition occurs.

64. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to cause program material contained in said broadcast signals to be stored in a computer file so as to permit the user to review the program material at a later time.

65. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to store said program material in a computer file with its associated program data.

66. A computer-readable storage medium as claimed in claim 58, wherein said video monitor forms part of a multimedia computer system.

67. A computer-readable storage medium as claimed in claim 58, wherein said computer runs under an operating system employing multiple windows and said binary information directs the computer to display program material carried by said broadcast signals in a said window in accordance with user instructions.

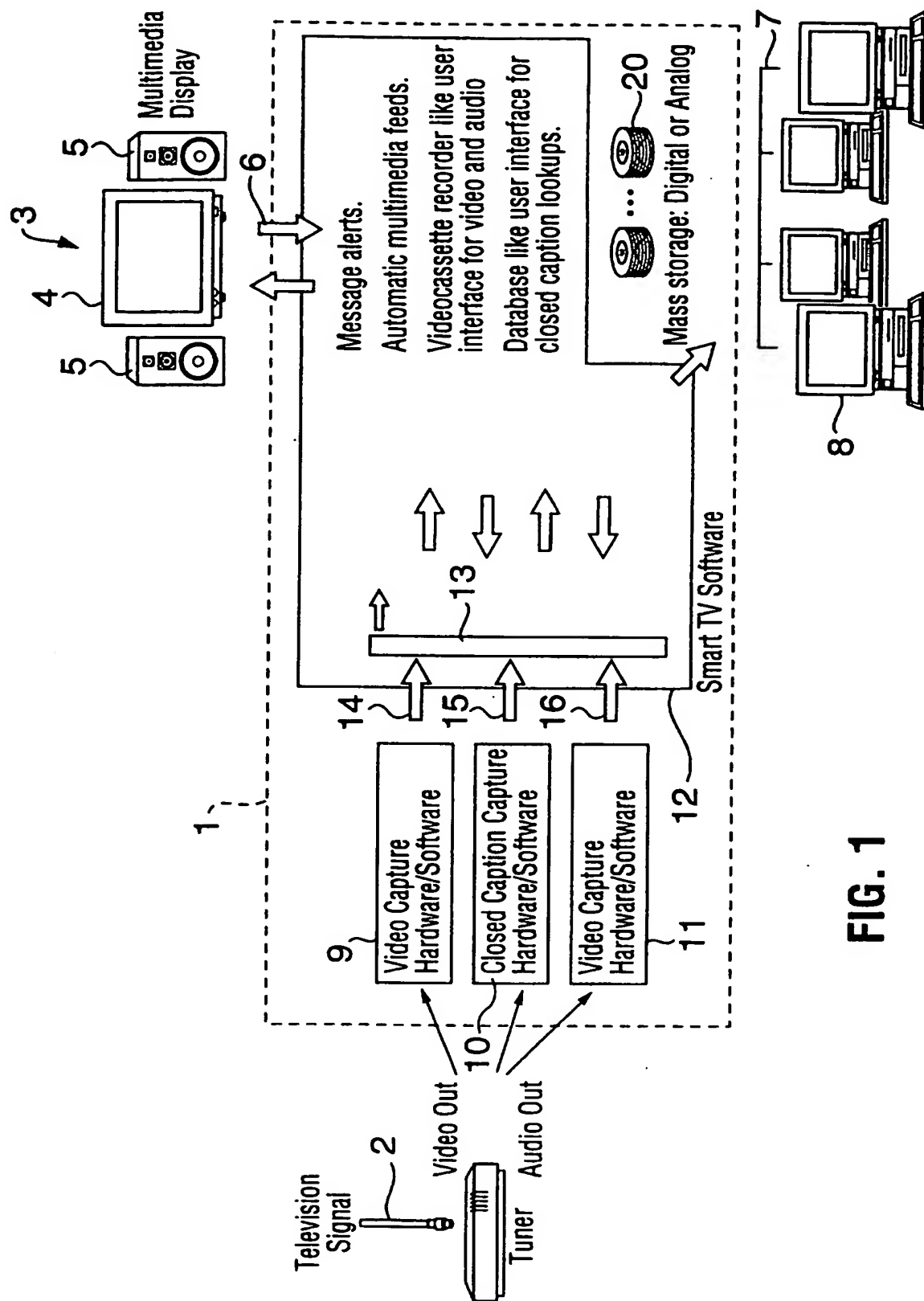
68. A computer-readable storage medium as claimed in claim 67, wherein said binary information directs the computer to display program material carried by said broadcast signals in a said window in response to said output condition and in accordance with user instructions.

69. A computer-readable storage medium as claimed in claim 68, wherein said binary information directs the computer to display said program material in a said window in association with related text material generated from said program data stream.

70. A computer-readable storage medium as claimed in claim 67, wherein said binary information directs the computer to permit the user to view any portion of said program material by pointing to the associated text material in a said window.

71. A computer-readable storage medium as claimed in claim 58, wherein said computer is a network server.

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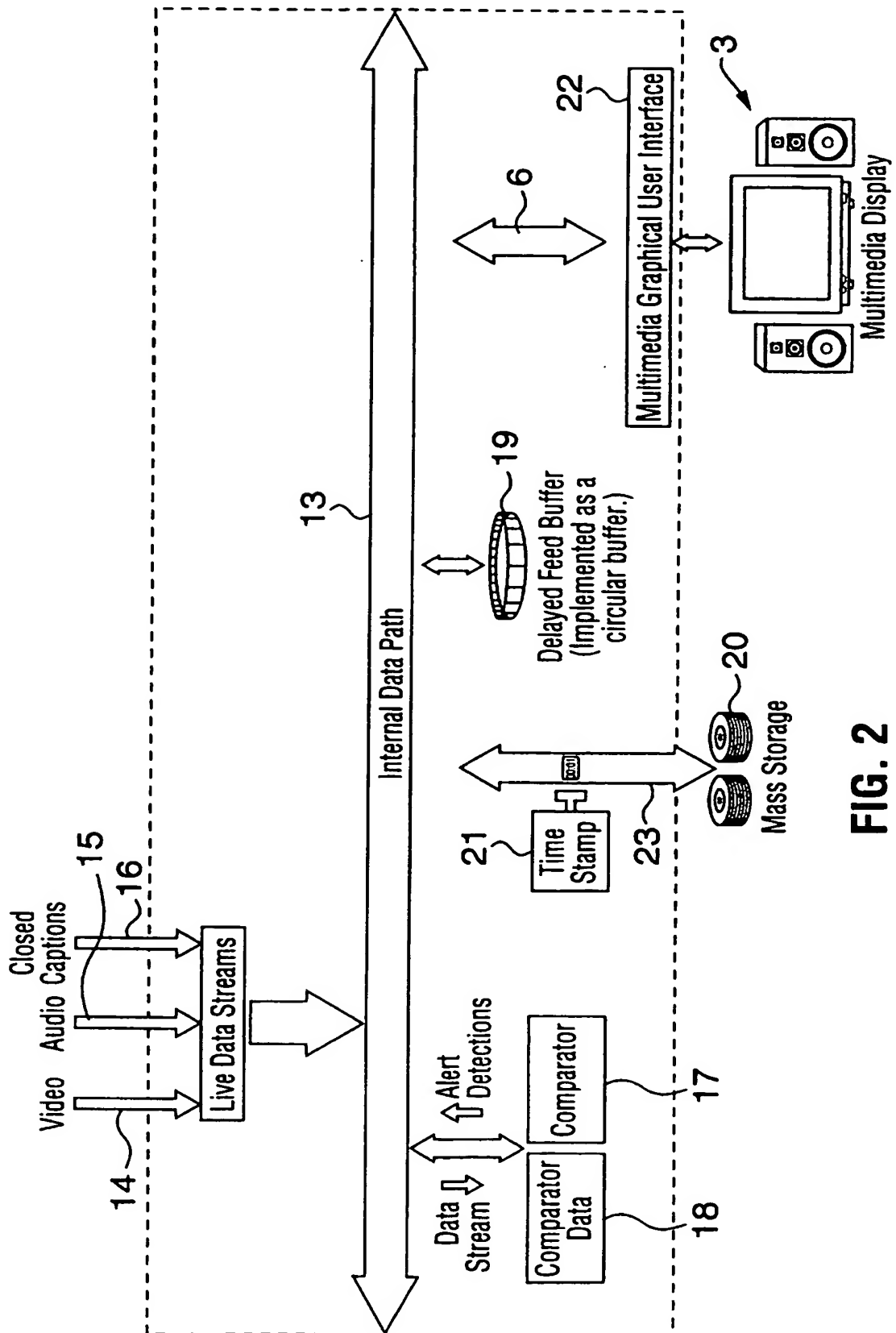


FIG. 2

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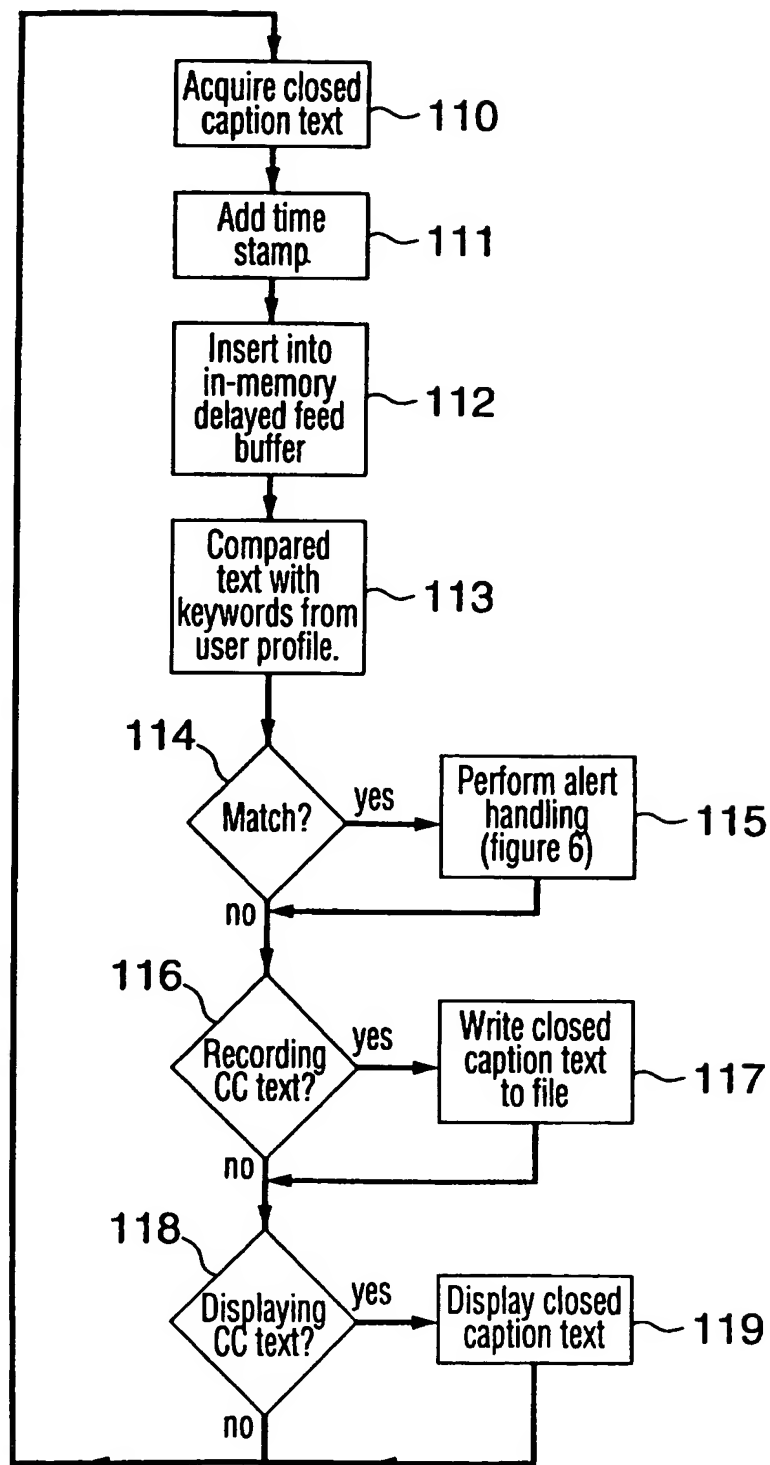


FIG. 3

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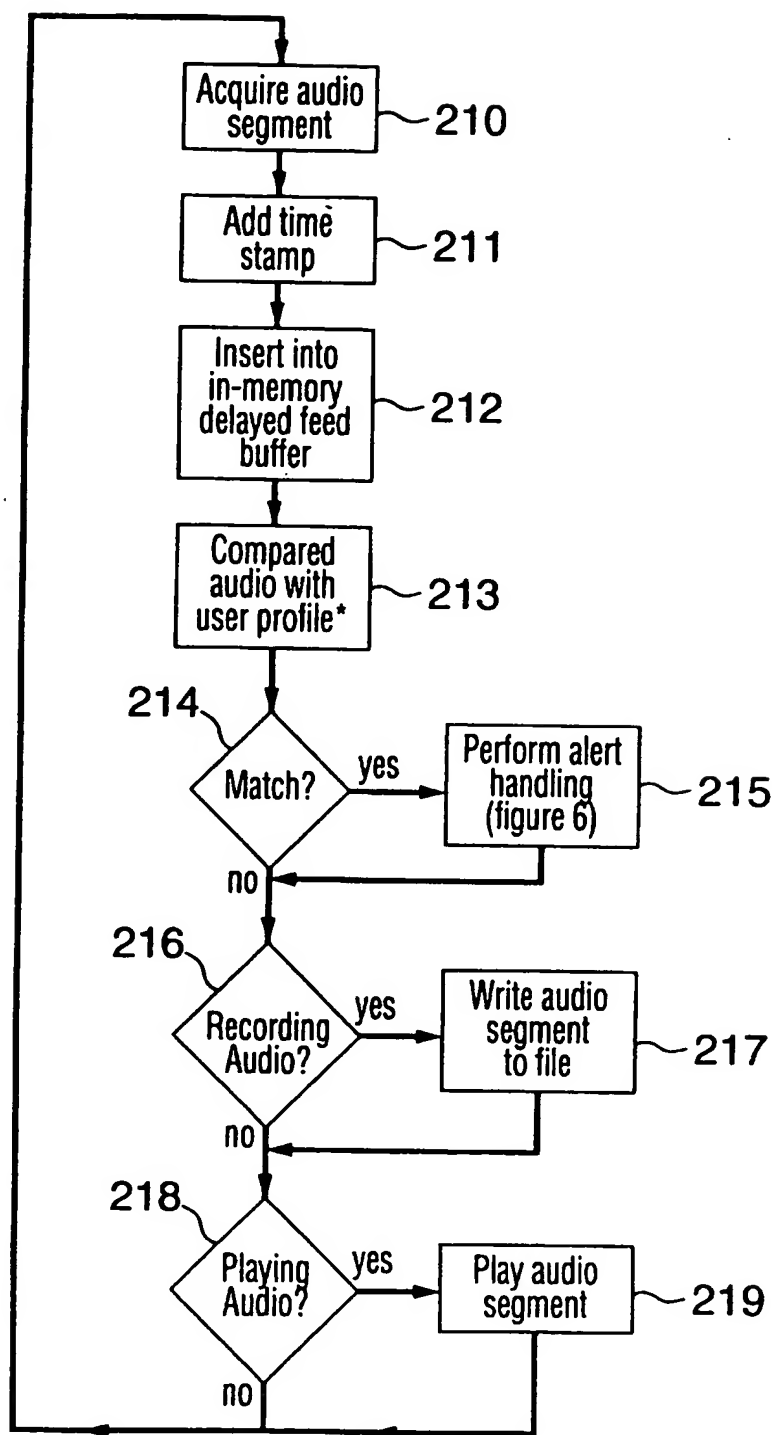


FIG. 4

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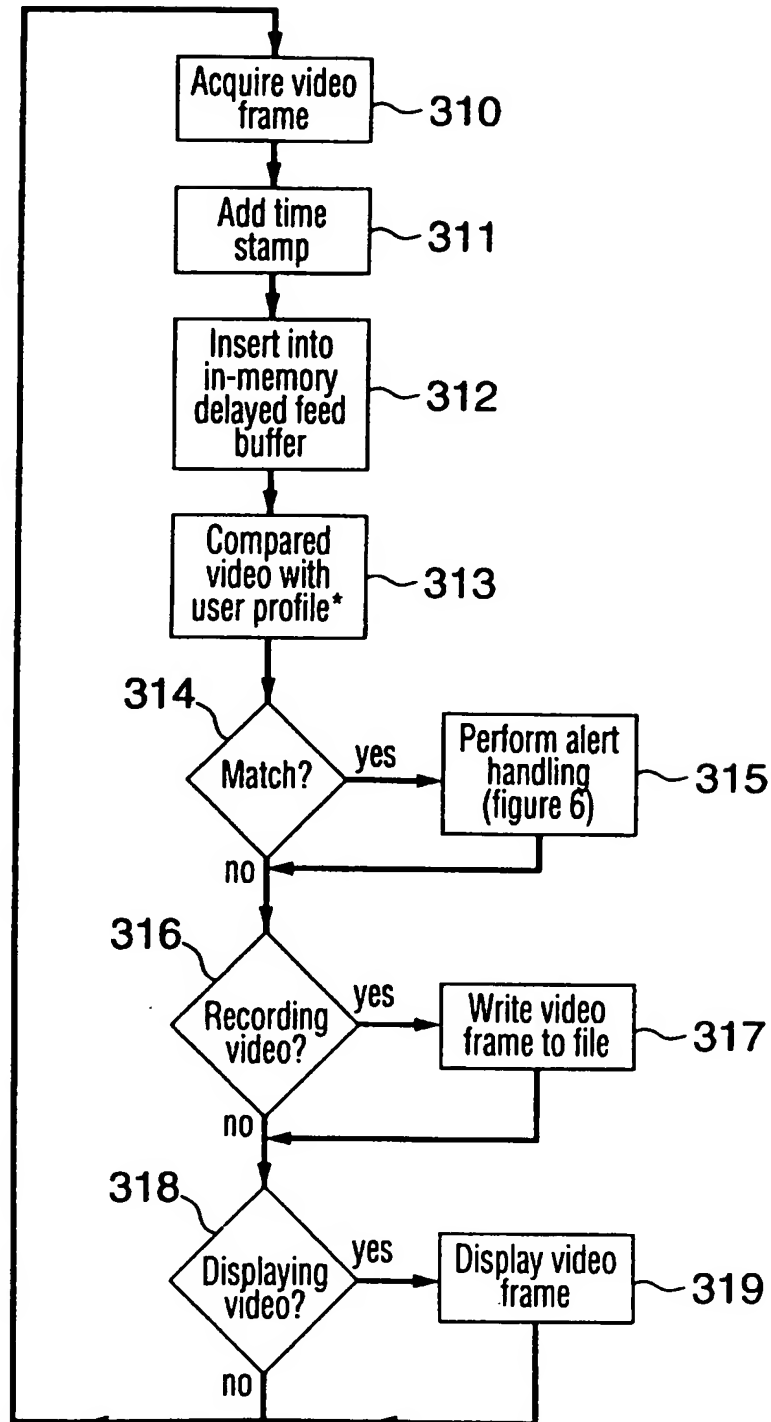


FIG. 5



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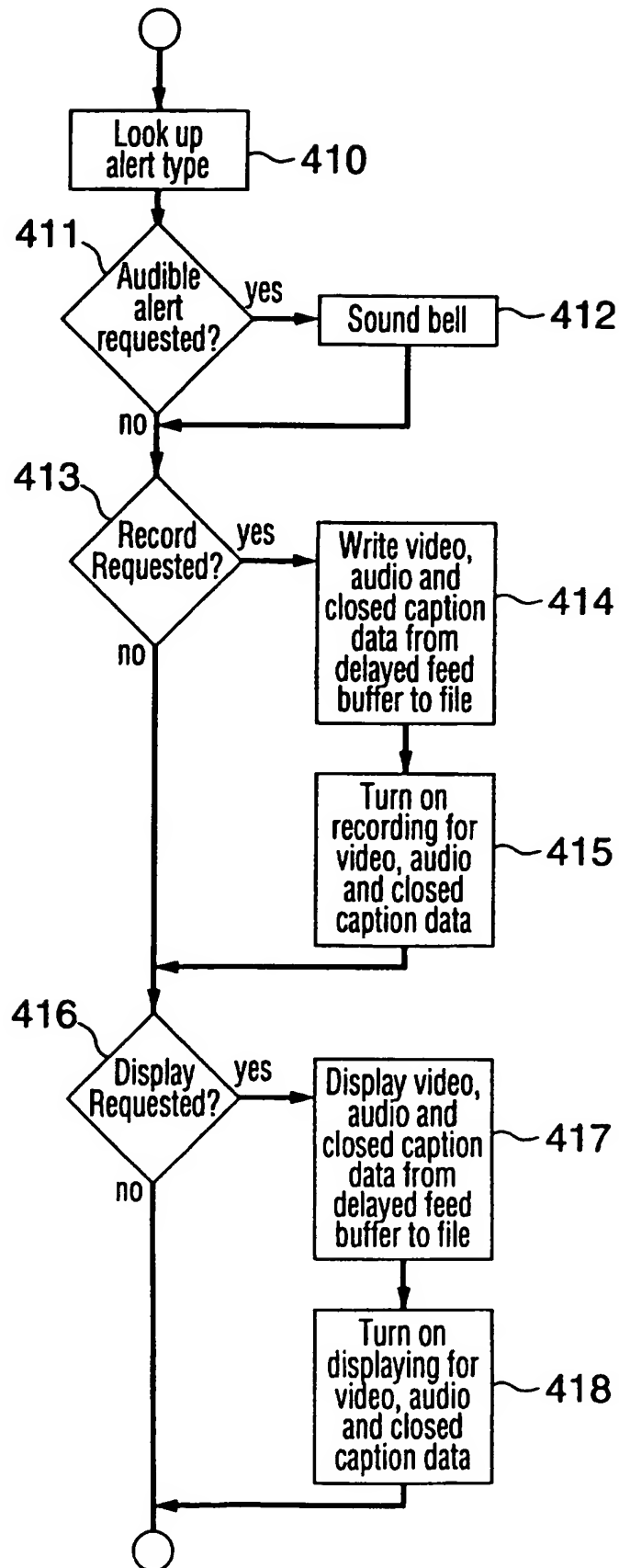


FIG. 6

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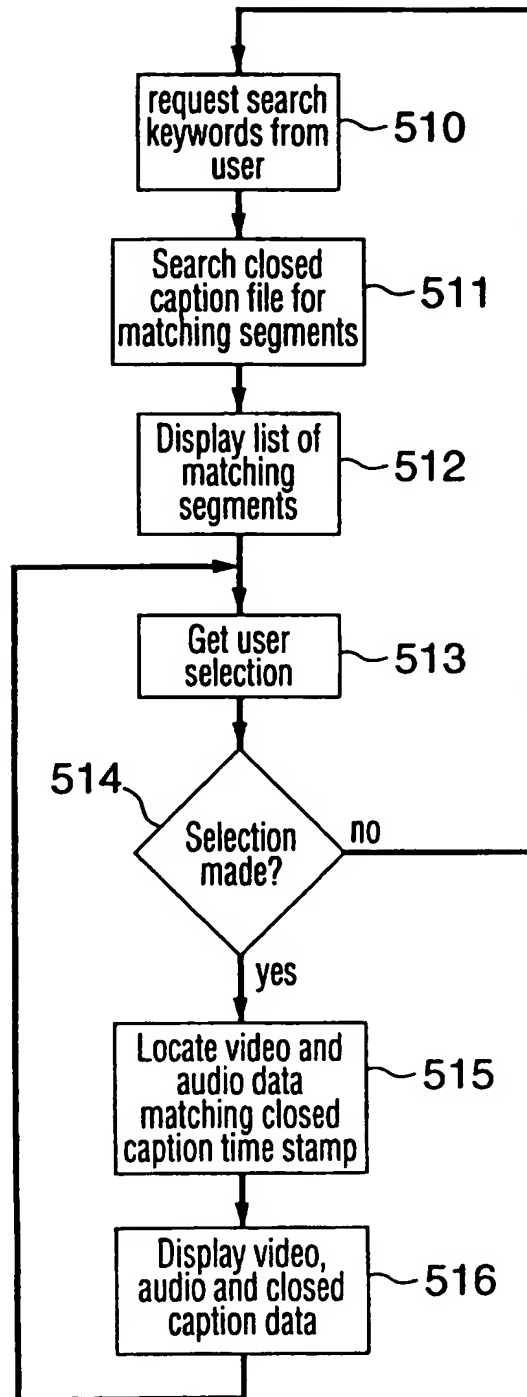


FIG. 7

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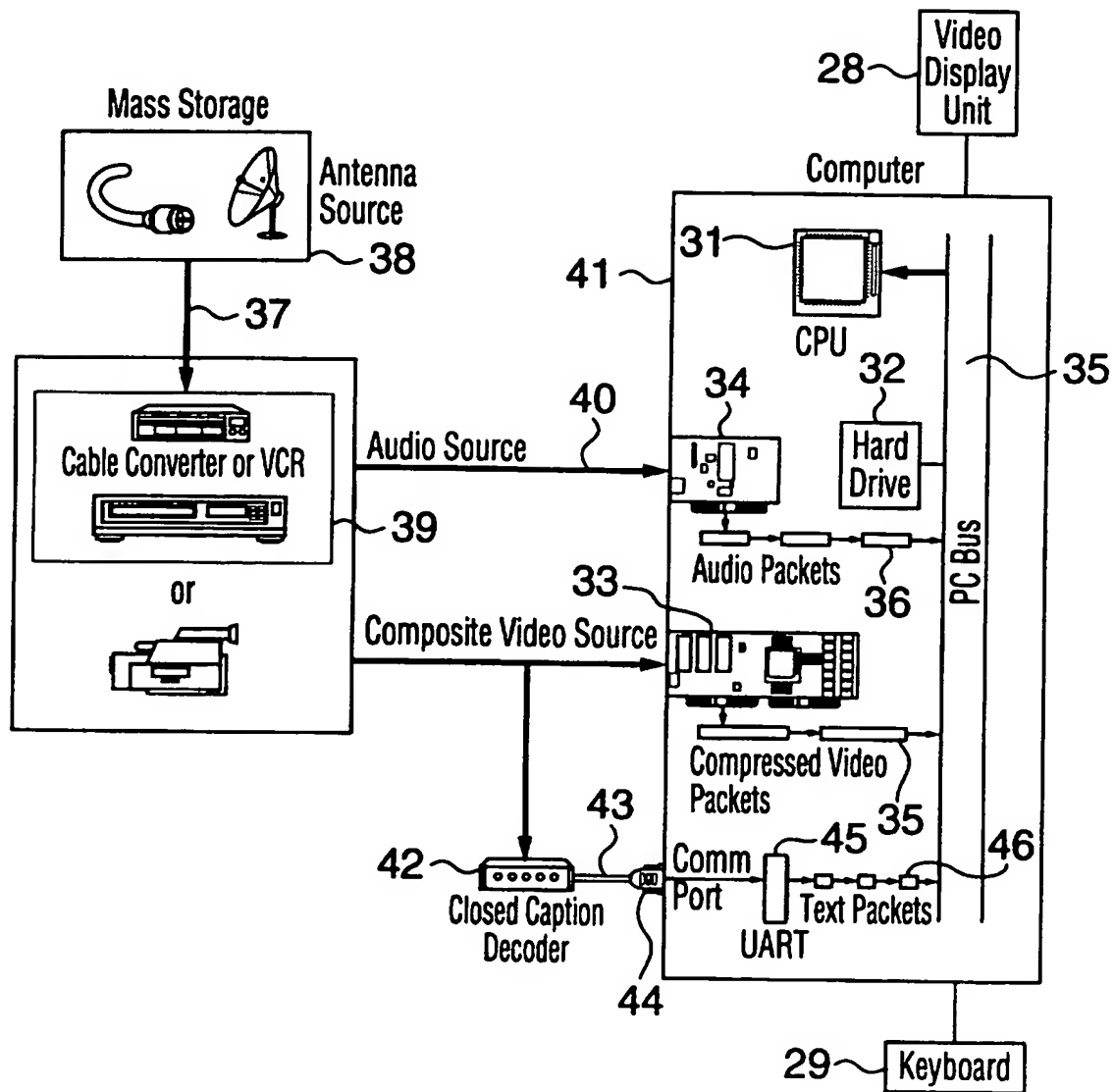
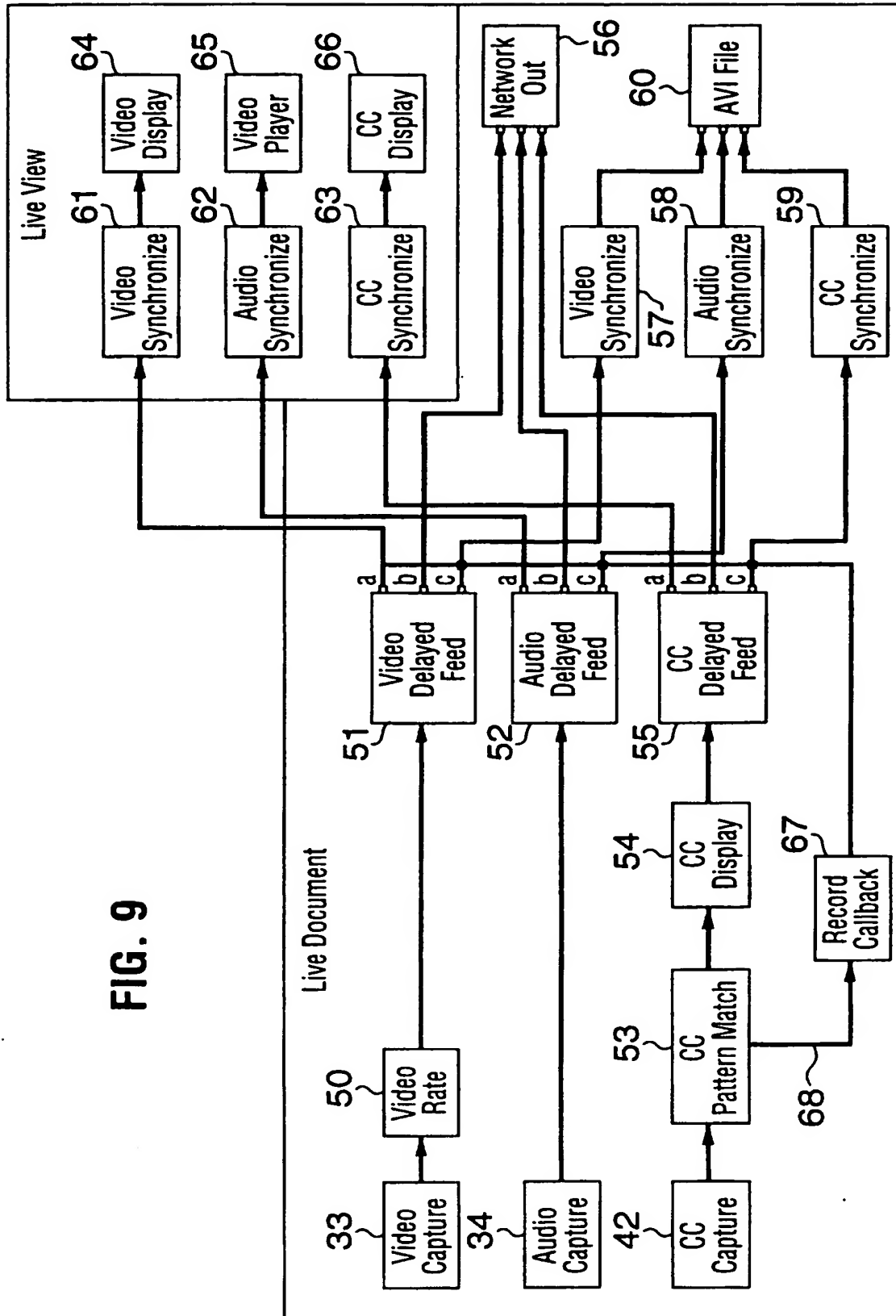
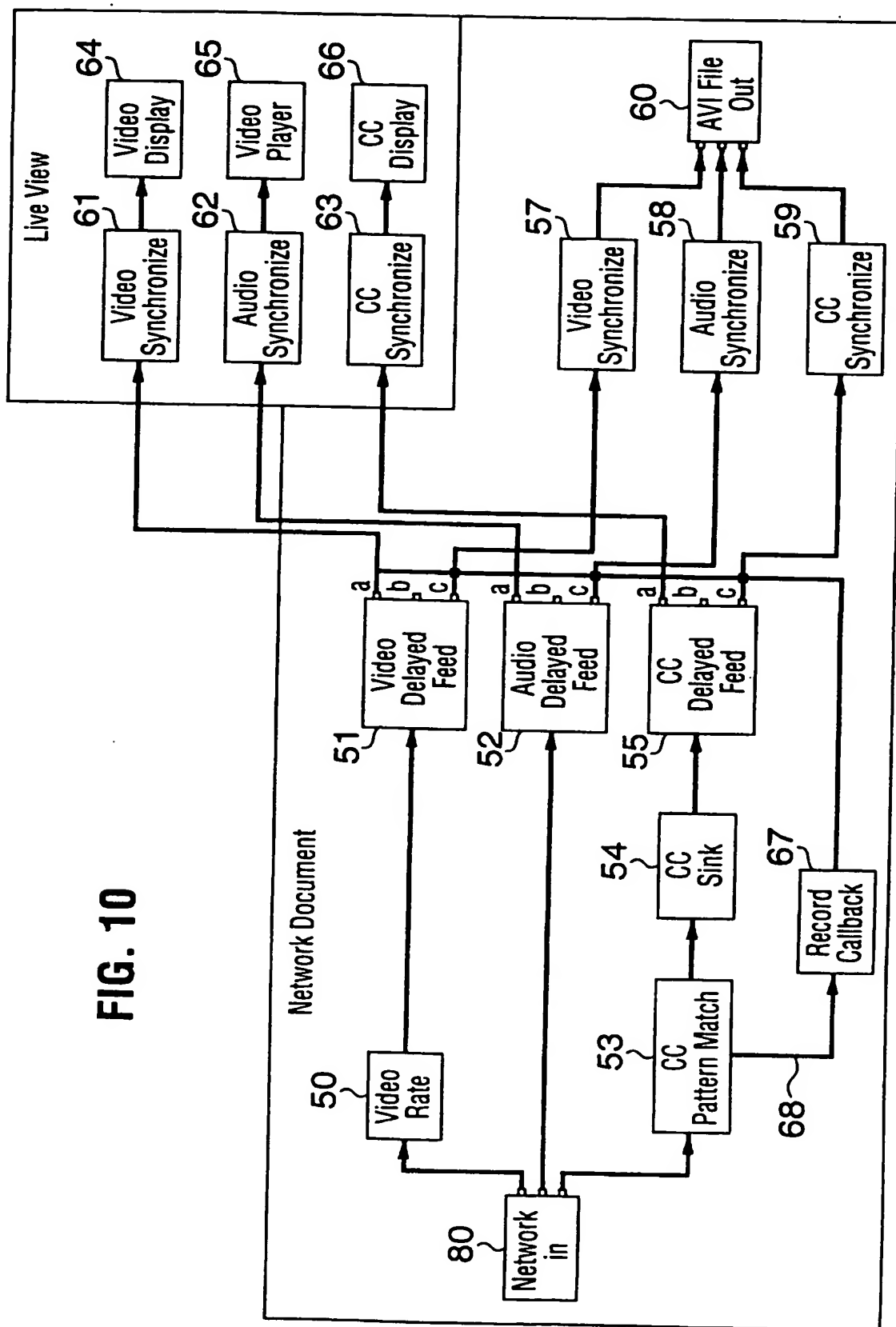


FIG. 8

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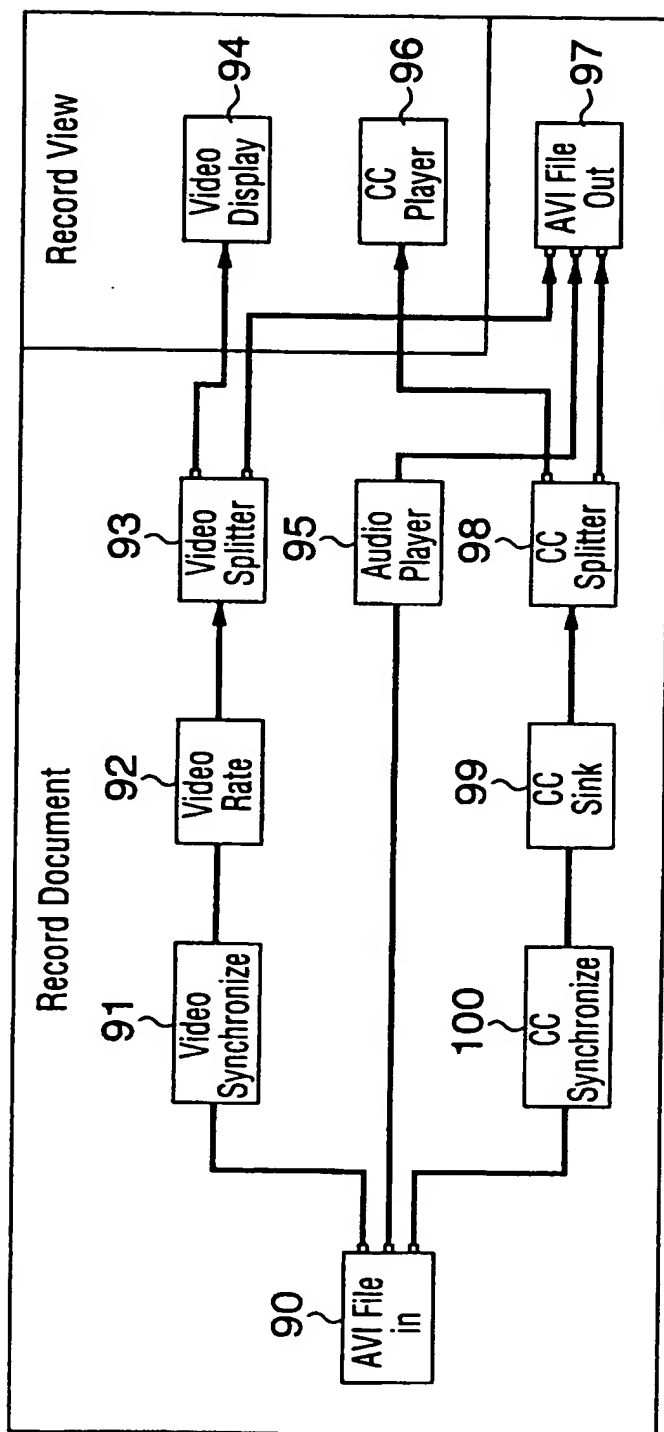


FIG. 11

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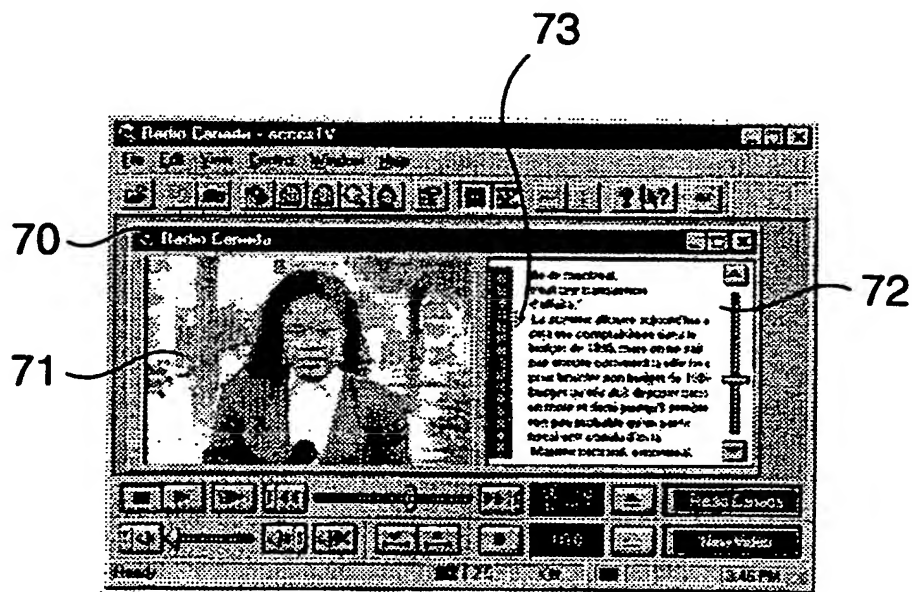


FIG. 12

Contents of Player (New Video)					
Name	Description	Date	Start	Length	Source
World Business	Int'l business news	Nov 12, 95...	00:00:00	00:00:30	CBC - SRC
World Business (2)	Int'l business news	Nov 12, 95...	00:00:30	00:01:22	CBC - SRC
News Brief	Daily News updates	Nov 12, 95...	00:00:53	00:04:59	CBC - SRC
World Business (3)	Int'l business news	Nov 12, 95...	00:01:53	00:00:30	CBC - SRC
World Business (4)	Int'l business news	Nov 12, 95...	00:03:04	00:01:21	CBC - SRC
User Clip	You Pressed Record	Nov 12, 95...	00:06:09	00:01:04	CBC - SRC
User Clip (2)	You Pressed Record	Nov 12, 95...	00:07:14	00:00:31	CBC - SRC

FIG. 13

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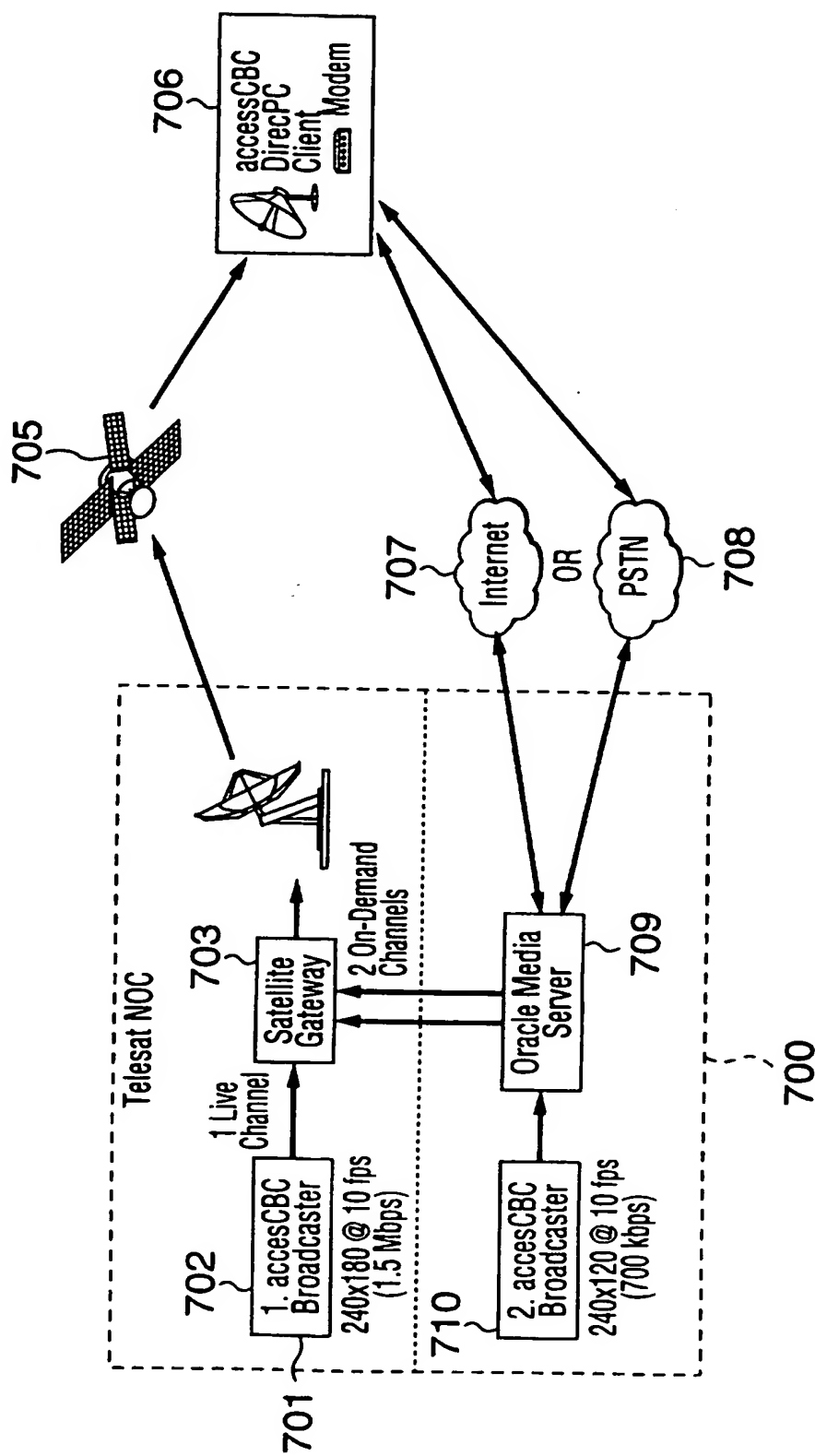


FIG. 14



## INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/CA 96/00131

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/30 G06F11/32 H04H9/00 H04N7/088 G06F17/60  
G11B27/034

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04H H04N G06F G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,4 857 999 (WELSH) 15 August 1989 see abstract see column 7, line 39 - column 8, line 58 see column 11, line 19 - line 34 ---	1-72
Y	US,A,5 253 061 (TAKAHAMA ET AL.) 12 October 1993 see abstract see column 4, line 3 - column 5, line 15 ---	1-72
A	US,A,5 343 251 (NAFEH) 30 August 1994 see abstract see column 7, line 13 - line 57 ---	11,12
A	US,A,5 210 611 (YEE ET AL.) 11 May 1993 see abstract ---	1
	-/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

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- "O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search

8 May 1996

Date of mailing of the international search report

07.06.96

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Absalom, R

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/CA 96/00131

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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		DE-T- 3750437	06-04-95
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US006597405	29	1 - 29	1
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US006597405B1

(12) **United States Patent**  
**Iggulden**

(10) Patent No.: **US 6,597,405 B1**  
(45) Date of Patent: **Jul. 22, 2003**

(54) **METHOD AND APPARATUS FOR  
AUTOMATICALLY IDENTIFYING AND  
SELECTIVELY ALTERING SEGMENTS OF A  
TELEVISION BROADCAST SIGNAL IN  
REAL-TIME**

(76) Inventor: **Jerry Iggulden, 21600 Cleardale St.,  
Santa Clarita, CA (US) 91321**

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/452,040**

(22) Filed: **Nov. 30, 1999**

#### Related U.S. Application Data

(63) Continuation of application No. 08/742,983, filed on Nov. 1,  
1996, now Pat. No. 6,002,443.

(51) Int. Cl.<sup>7</sup> ..... **H04N 5/44**

(52) U.S. Cl. .... **348/553; 348/907; 348/460;  
725/22; 725/14; 725/19; 725/28**

(58) Field of Search ..... **348/553, 632,  
348/687, 690, 552, 907, 722, 465, 460;  
725/32, 42, 22, 14, 19, 20, 25, 28, 34**

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Primary Examiner—John Miller

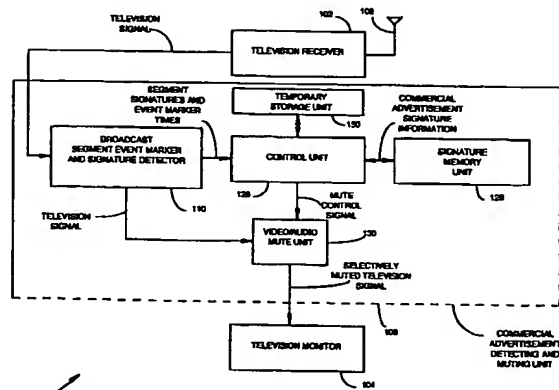
Assistant Examiner—Linus M. Lo

(74) Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor &  
Zafman, LLP

#### (57) ABSTRACT

The method and apparatus identifies selected broadcast segments, such as commercial advertisements, of a television signal in real-time for the purpose of muting the video and audio portions of the television signal during each unwanted segment. A signature pattern associated with each segment of the television signal is detected and compared to stored signature patterns representative of selected segments such as commercial advertisement segments. If the signature pattern matches one of the stored signature patterns, the segment is thereby immediately identified as being one of the selected segments and is processed in real-time to mute the audio and video portions of the television signal during the segment. If the signature pattern of the segment does not match any of the stored signature patterns, the segment is analyzed to determine whether the segment is nevertheless a selected segment and, if so, its signature pattern is stored along with the stored signature patterns. The analysis to determine whether the segment is nevertheless a selected segment is performed by detecting the length of the segment upon its completion and then determining whether the length of the segment matches one of a pre-determined set of permissible selected segment lengths such as standard commercial advertisement segments of 15 seconds, 30 seconds, or 60 seconds. If so, the segment is identified as being a selected and its signature pattern is stored along with the other stored signature patterns such that, the next time the same segment is encountered, its signature will then match the stored signature and therefore the segment can be immediately identified and muted in real-time.

8 Claims, 14 Drawing Sheets



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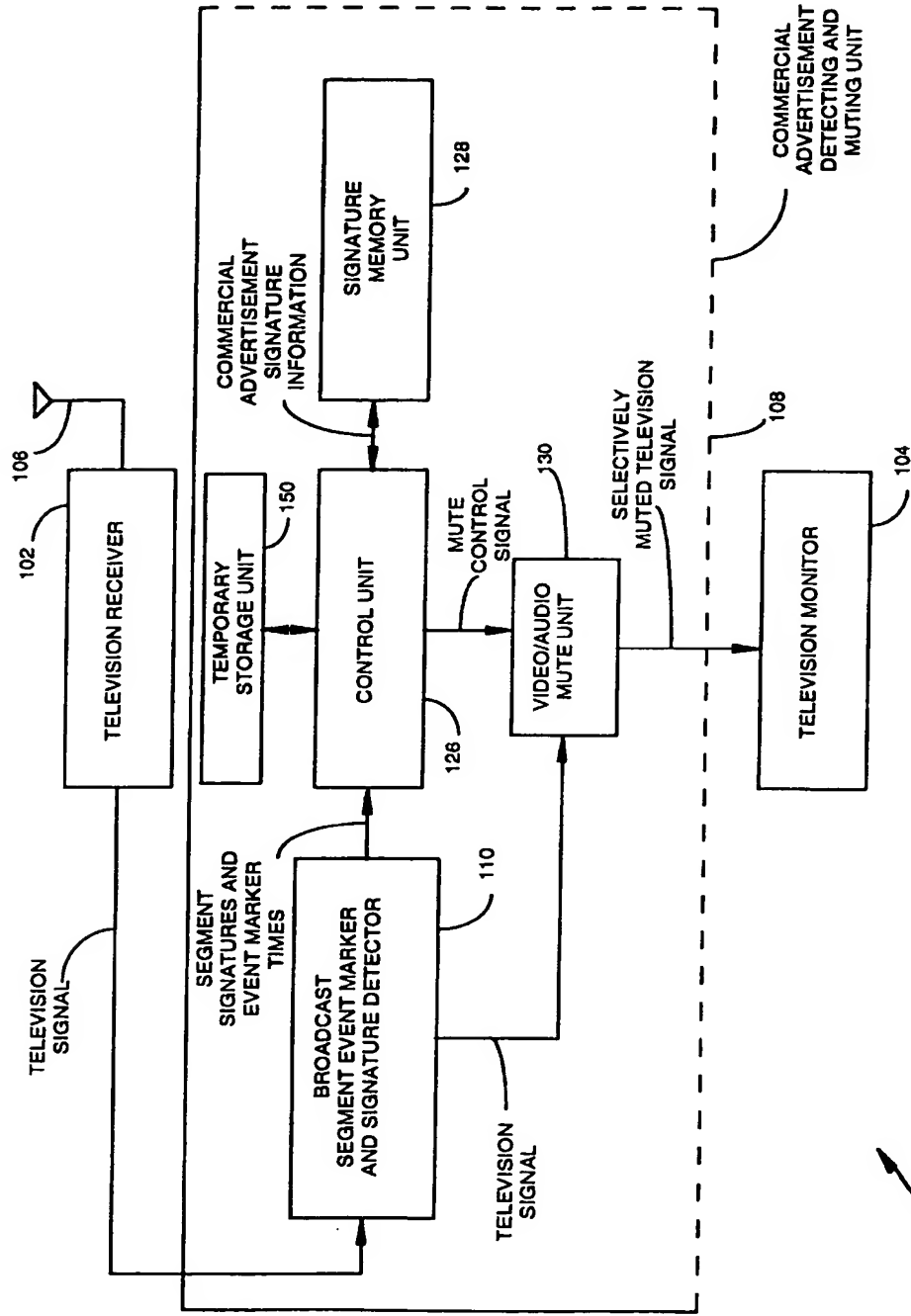
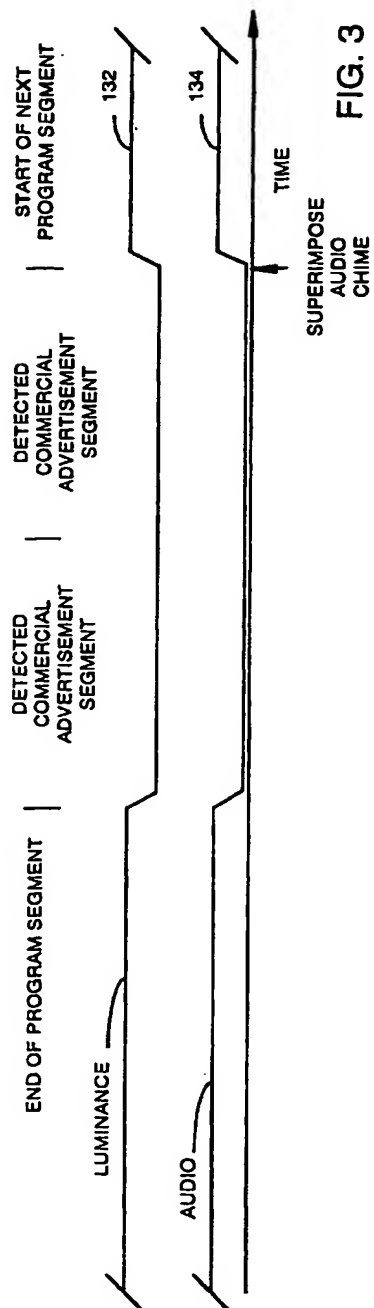
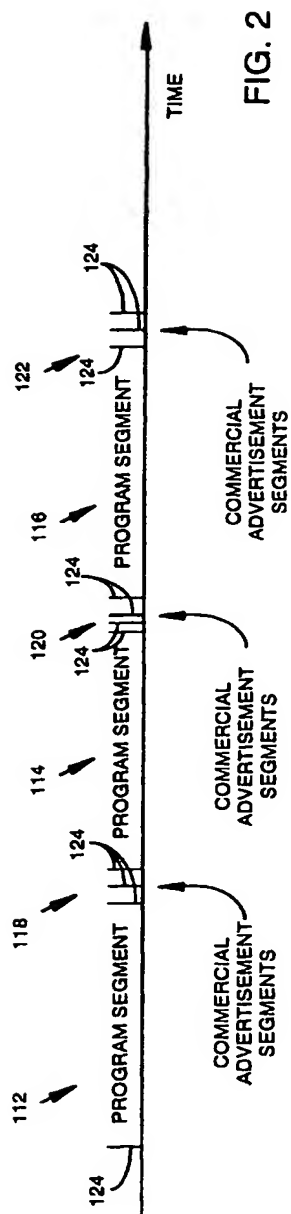
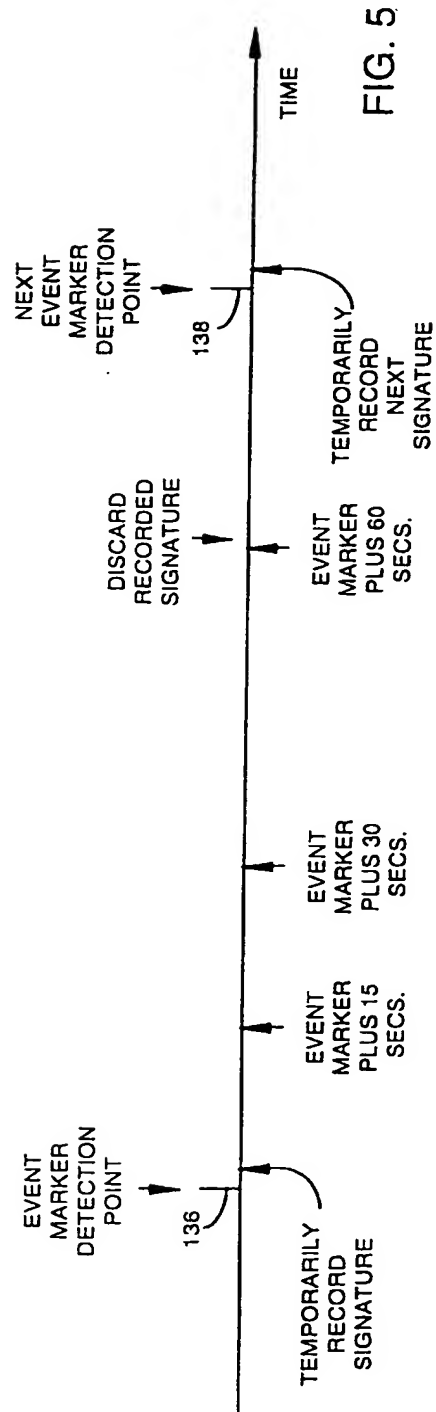
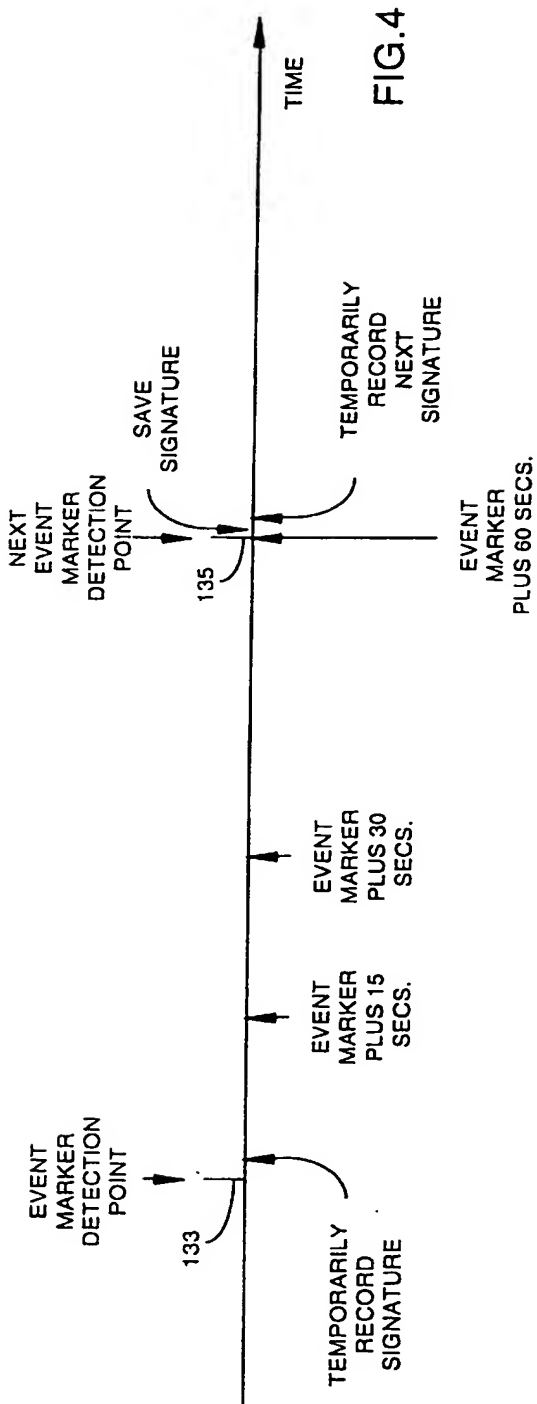
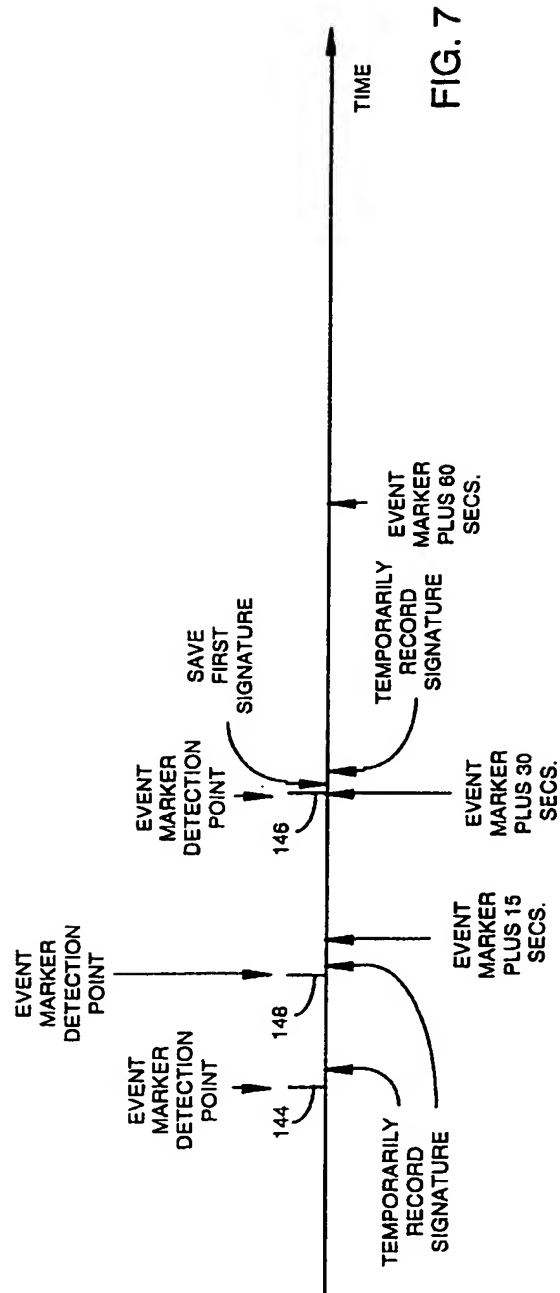
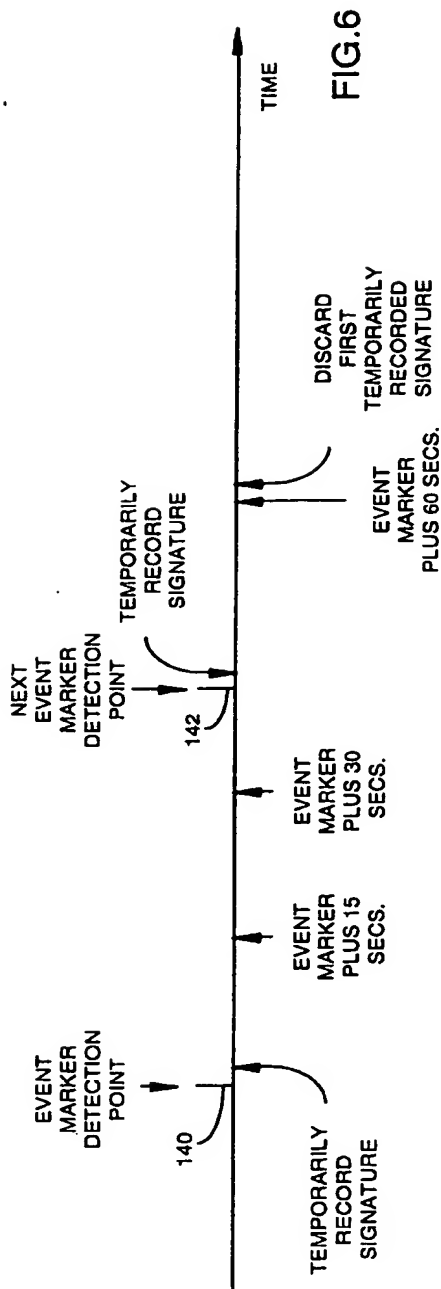


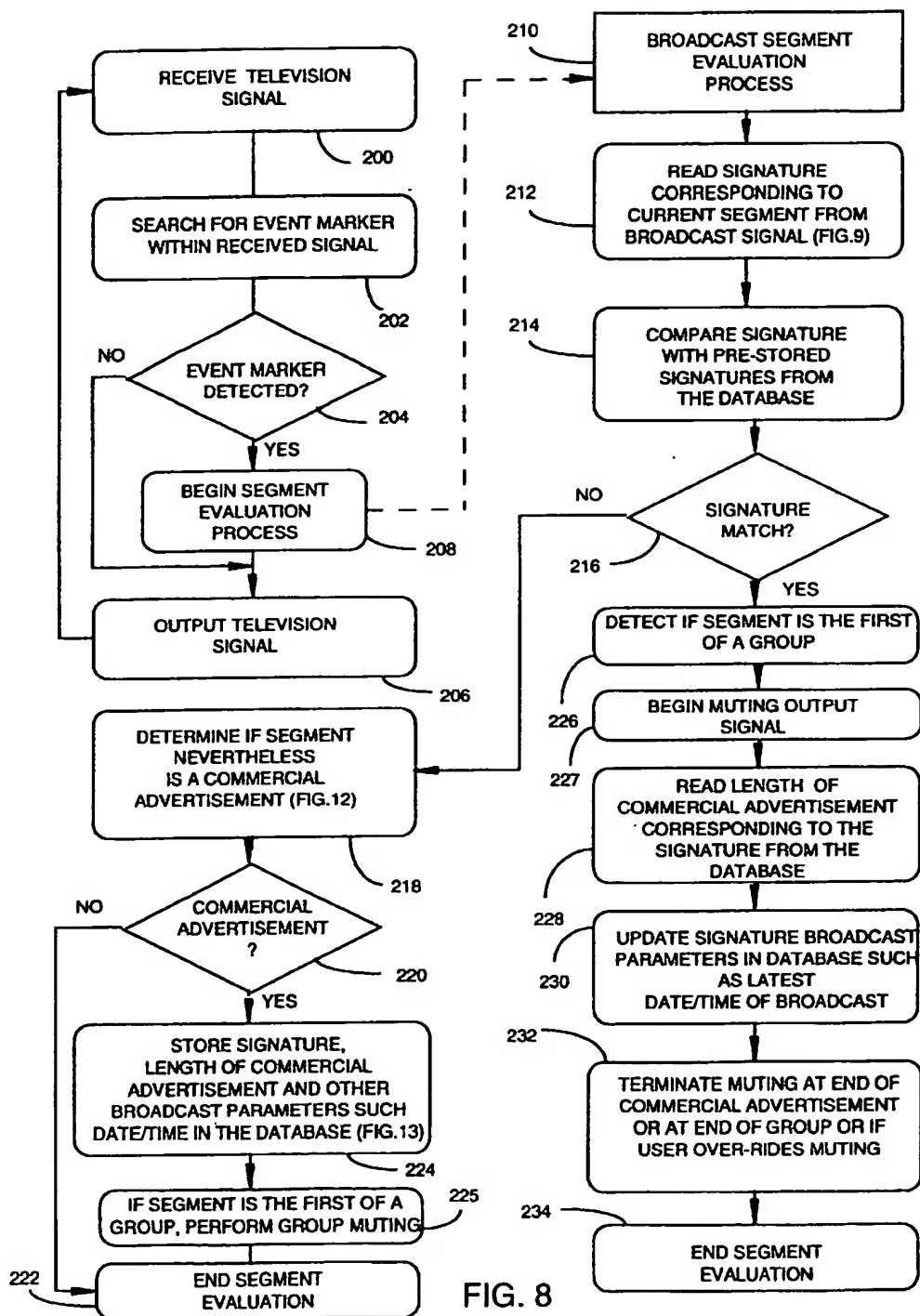
FIG. 1











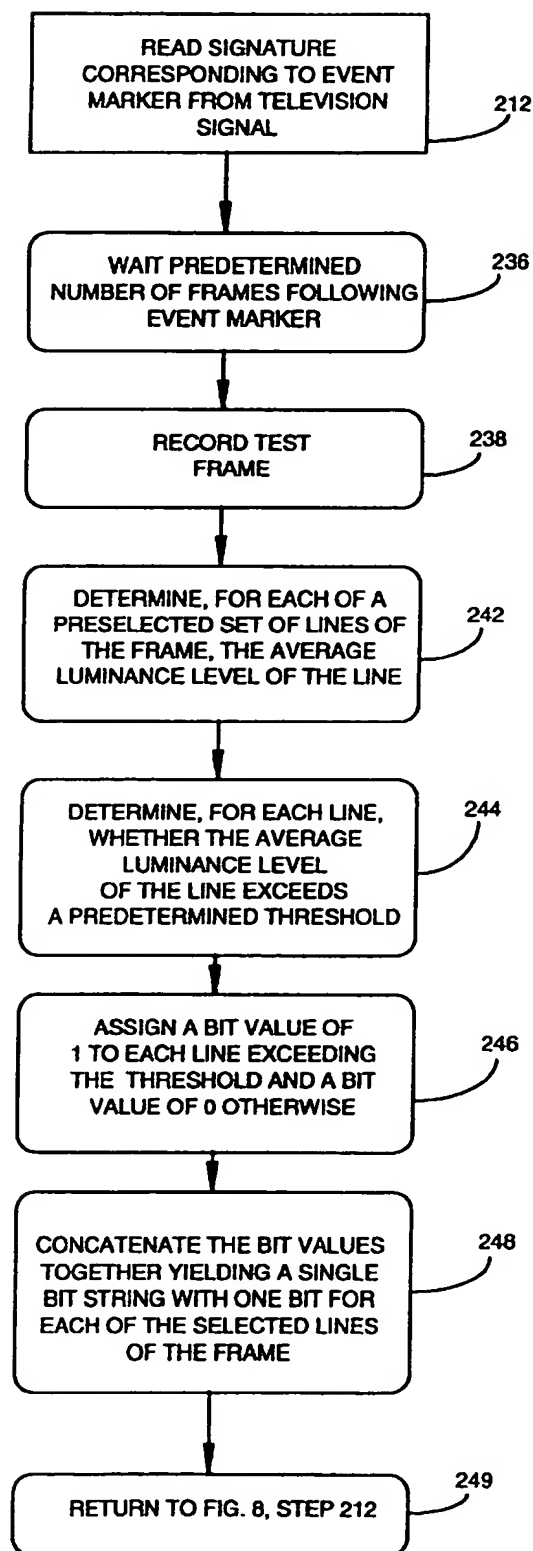


FIG. 9

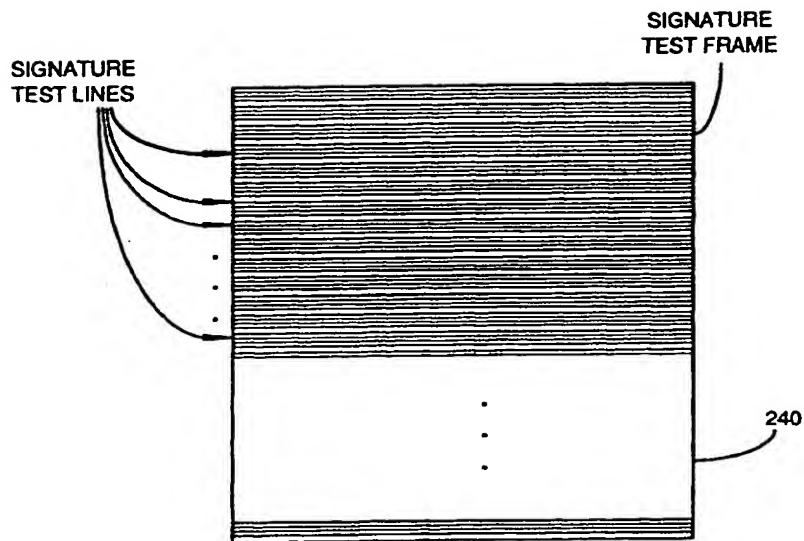


FIG. 10

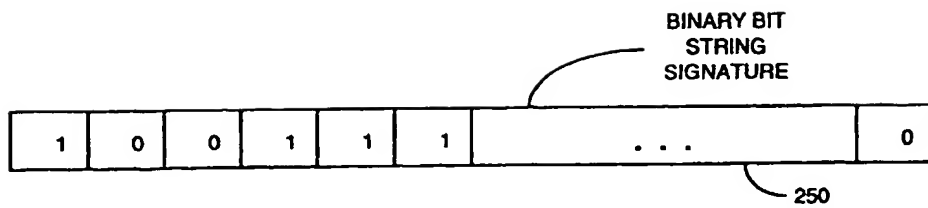


FIG. 11

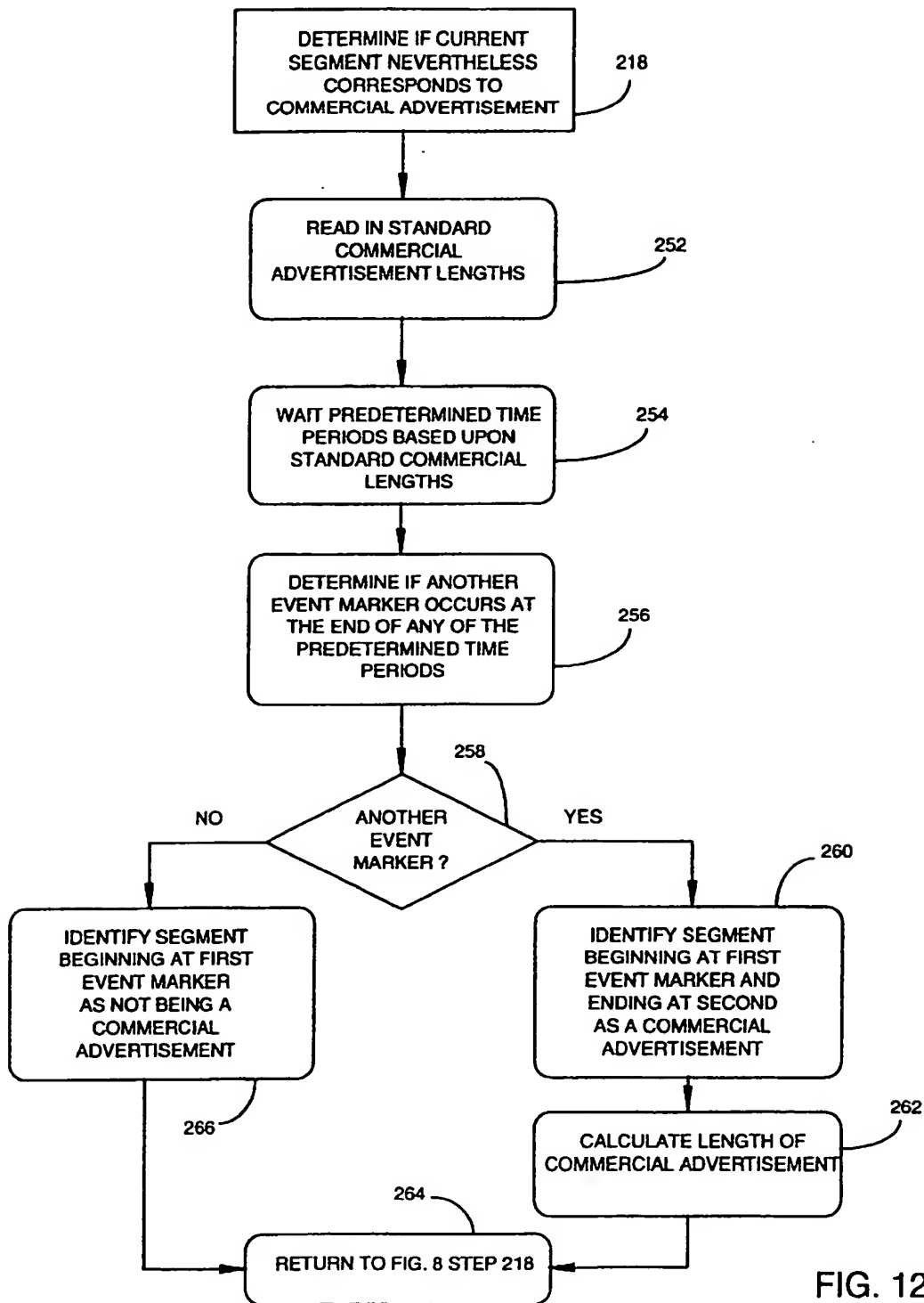


FIG. 12

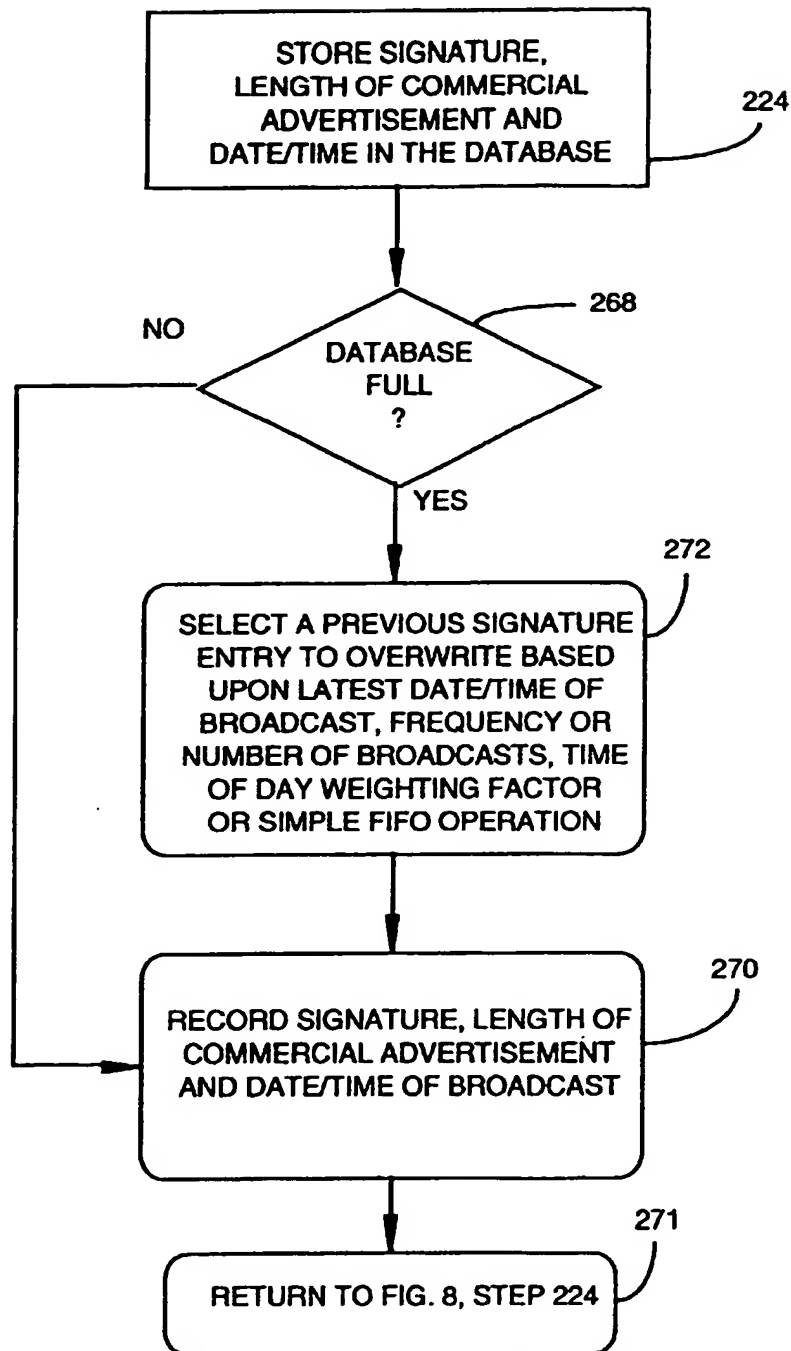


FIG. 13





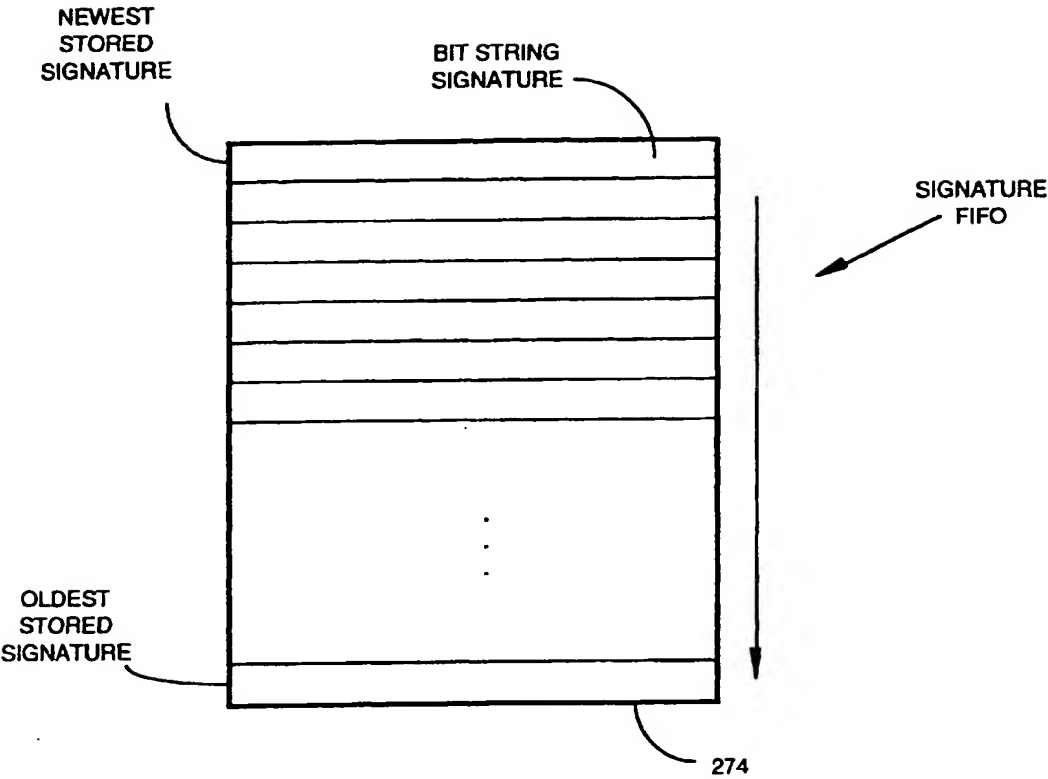
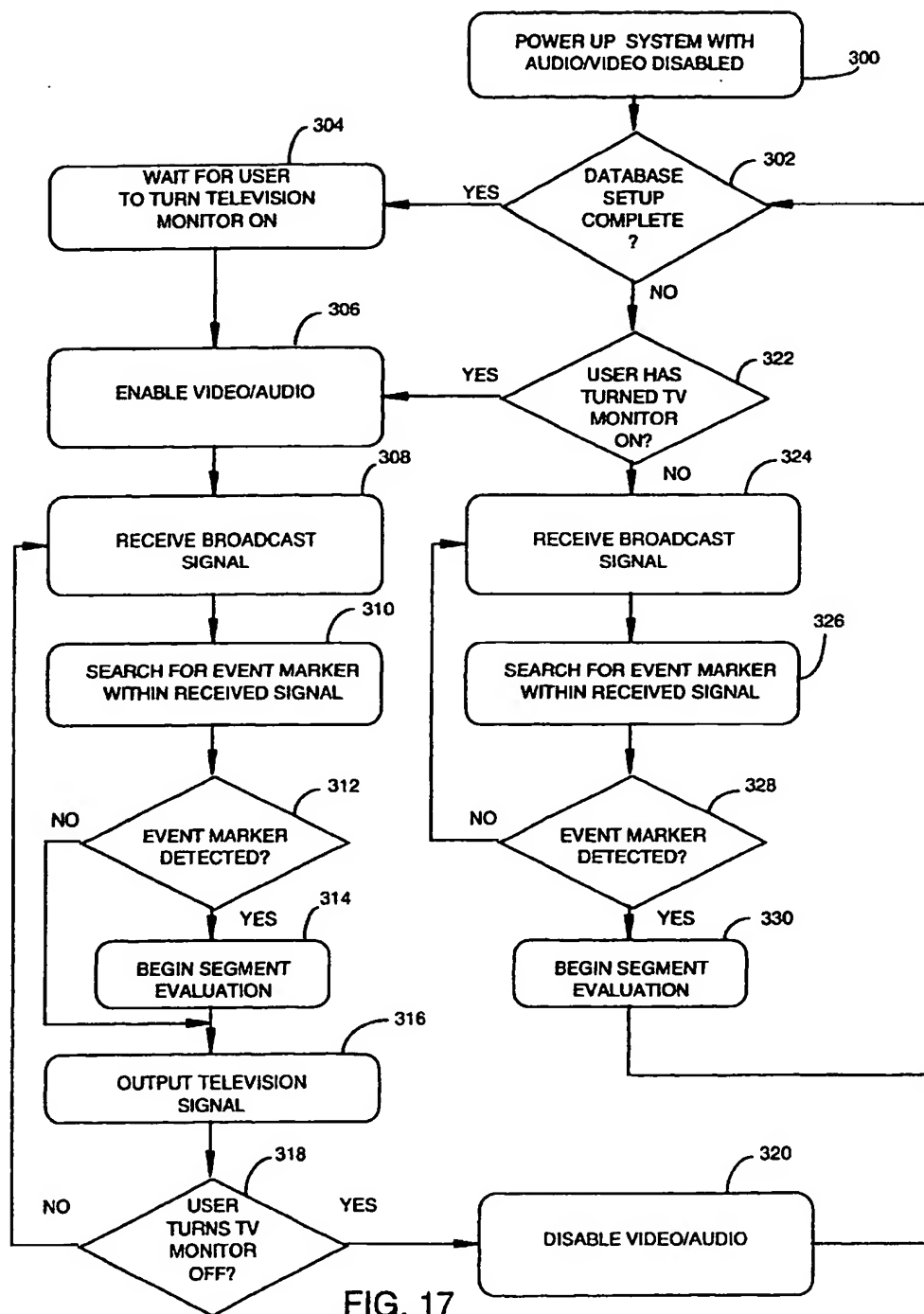


FIG. 15



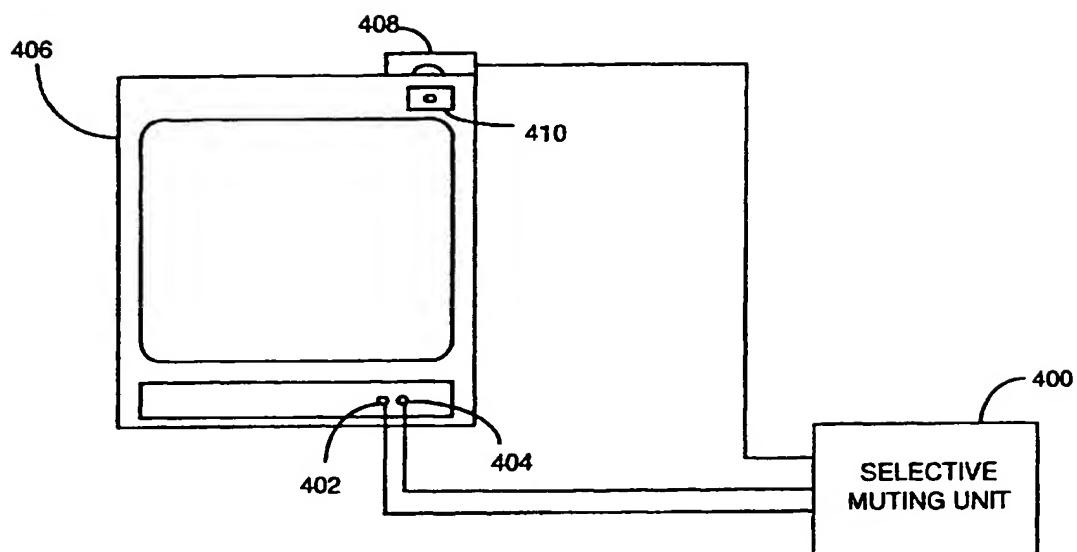


FIG. 18

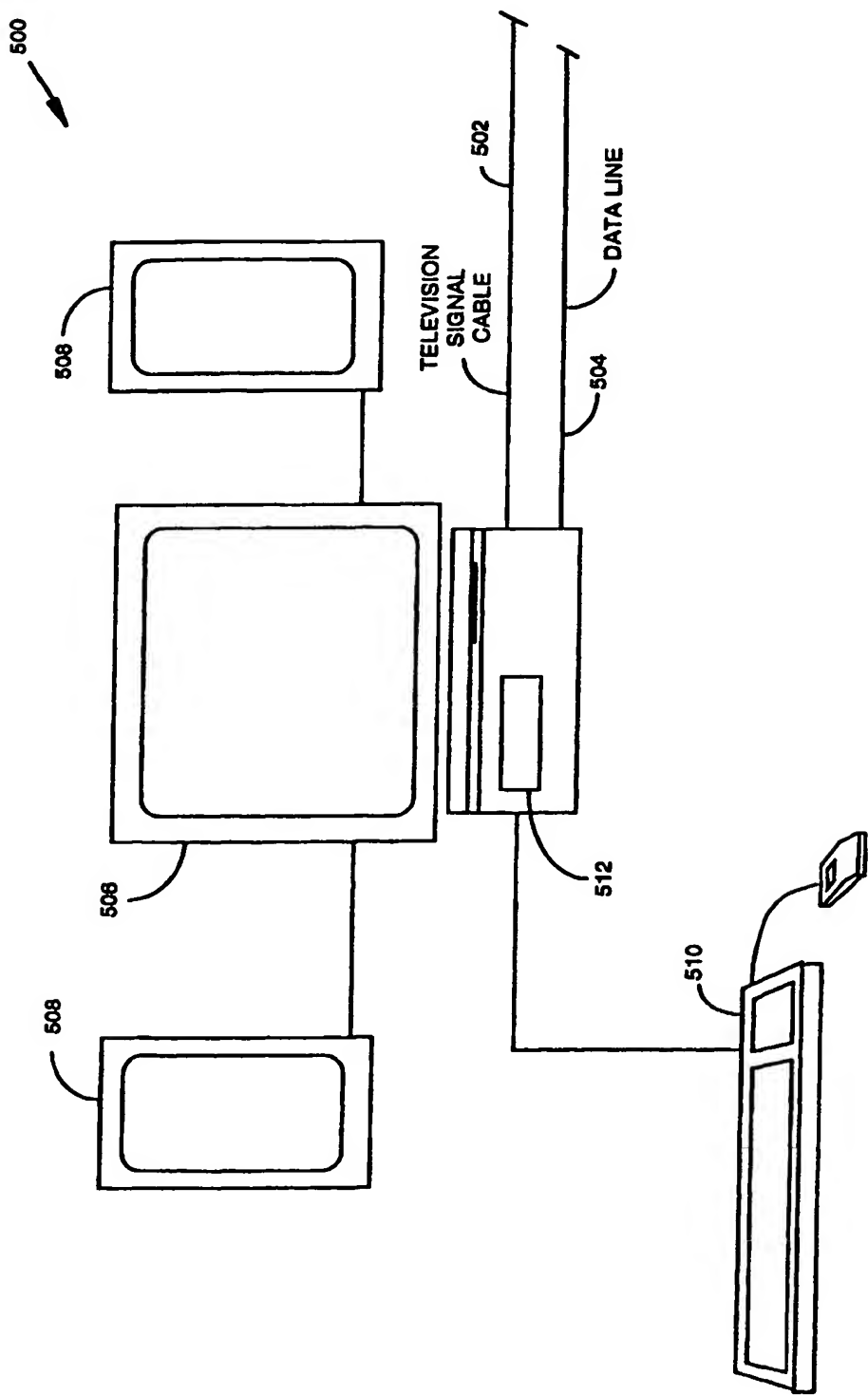


FIG. 19

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# METHOD AND APPARATUS FOR AUTOMATICALLY IDENTIFYING AND SELECTIVELY ALTERING SEGMENTS OF A TELEVISION BROADCAST SIGNAL IN REAL-TIME

This application is a continuation of application Ser. No. 08/742,983 filed Nov. 1, 1996, now U.S. Pat. No. 6,002,443.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The invention relates to television signal processing systems and in particular to television signal processing systems for detecting selected segments of a television signal such as commercial advertisement segments.

### 2. Description of Related Art

It has long been a desire of many television viewers to have a system which automatically detects selected segments of a television signal such as commercial advertisements or other unwanted broadcast segments in real-time during a television broadcast for the purpose of, for example, muting the audio portion of the television broadcast during the unwanted broadcast material. Although a wide variety of techniques have been developed for detecting selected segments of television signals, heretofore there have been no sufficiently effective and economical systems that automatically operate in real-time for muting or similar purposes.

Examples of broadcast segment detection systems include systems for detecting commercial advertisements during the playback of a television program on a video cassette recorder (VCR) for the purpose of controlling the VCR to skip or scan over the commercial advertisements during playback such that a viewer may watch the recorded television program without significant commercial advertisement interruptions. One particularly effective system is described in U.S. Pat. No. 5,333,091 entitled "Method and Apparatus for Controlling a Videotape Player to Automatically Scan Past Recorded Commercial Messages" and sold under the trademark "Commercial Advance." With the system of U.S. Pat. No. 5,333,091, an automatic editing device is coupled between a conventional VCR and a conventional television set. As a broadcast program is recorded on a videotape by the VCR, the editing device detects and records the timing and duration of selected events, such as black frames combined with low audio, that separate segments of the broadcast and creates a time-based map of the selected events. After the recording is completed, the editing device analyzes the time-based map and determines therefrom which segments are commercial advertisement segments and which are program segments. The editing device then records control signals on the videotape prior to and following the commercial advertisement segments. Upon playback, the control signals control the VCR to fast-scan over the commercial advertisement segments so that the recorded broadcast can be viewed substantially without interruption. Related techniques are described in U.S. Pat. No. 5,455,630 and in PCT application PCT/US94/00223 published as WO 94/16442.

Although the systems of U.S. Pat. Nos. 5,333,091 and 5,455,630 and PCT application PCT/US94/00223 are very effective in skipping over commercial advertisements and other unwanted broadcast material during the playback of a recorded broadcast program on a videotape, the systems do not operate in real-time during a received broadcast.

Other examples of broadcast segment detection systems include systems for detecting commercial advertisements

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during the recording of a television program on a VCR for the purposes of controlling the VCR to skip the commercial advertisements during recording such that a viewer may later watch the recorded television program without any commercial advertisement interruption whatsoever. An example is a system described in U.S. Pat. No. 4,602,297 entitled "System for Editing Commercial Messages from Recorded Television Broadcasts" which stores and delays the output of a received broadcast signal to a VCR until it can determine whether the delayed portion of the broadcast signal includes commercial advertisements. To this end, the system detects commercial advertisements or groups of commercial advertisement within the delayed portion by detecting amplitude drops in the broadcast signal and determining whether time intervals between the amplitude drops correspond to normal durations of commercial advertisements or groups of commercial advertisements. The system then outputs only those portions of the delayed signal to the VCR that do not correspond to commercial advertisements of groups of commercial advertisements. Hence, the broadcast signal is recorded without commercial advertisements for future playback.

Other examples of systems for detecting commercial advertisements during the recording of a television program are described in U.S. Pat. No. 4,750,052 entitled "Apparatus and Method for Automatically Deleting Selected Program Intervals from Recorded Television Broadcasts" and U.S. Pat. No. 4,782,401 entitled "Editing Method and Apparatus for Commercials During Video Recording", both of which also operate to detect commercial advertisements based upon intervals occurring between amplitude drops or other fads in a received broadcast signal. Rather than storing and deleting the received signals prior to output to a VCR, however, the systems of U.S. Pat. Nos. 4,750,052 and 4,782,401 record the signals on a video tape using a VCR and control the VCR to rewind at the end of each commercial advertisement or group of advertisements such that further program signals are recorded over the commercial advertisements.

None of the aforementioned systems for detecting broadcast segments during the recording of a television program operate in real-time for the purpose of, for example, muting the audio during commercial advertisements.

Still other examples of broadcast segment detection systems include systems for detecting commercial advertisements in broadcast television signals for the purposes of verifying that selected commercial advertisements are being broadcast on the proper days and at the proper times. Examples include U.S. Pat. No. 5,504,518 entitled "Method and System for Recognition of Broadcast Segments" wherein stored digitized segments of broadcast signals are processed by an expert system to determine whether any particular segment corresponds to a selected segment of interest, such as a selected commercial advertisement. Segments that cannot be identified by the expert system, such as new or otherwise unknown segments, are routed to a human operator for verifying that the segment represents a commercial advertisement rather than a portion of a television program. Selected segment information such as the date and time of broadcast of the segments of interest are recorded and tabulated in a report for use by, for example, broadcast advertisers for verifying that the selected segments were broadcast on the proper dates and at the proper times. As part of its analysis of the segments, the expert system compares broadcast signatures with a database of signatures. A variety of techniques are described for defining and detecting signatures. The expert system also considers various cues

indicating the lengths and relative groupings of segments and the intervals therebetween. No real-time analysis appears to be performed by the expert system or by the human operator.

Another system for commercial advertisement broadcast verification is described in Japanese Laid-Open Patent Application No. 1-174192, of Sony Corporation, entitled "Television Signal Processing Unit" wherein an entire days worth of broadcast programs are recorded on videotape. The recorded broadcasts are analyzed to identify commercial advertisement segments by intervals therebetween as detected by luminance signal considerations. The commercial advertisements, and only the commercial advertisements, are then output and recorded on a second videotape. The second videotape thereby contains a days worth of commercial advertisements in extracted form that may be viewed by a human operator for broadcast verification purposes. Again, no real-time detection of commercial advertisements is performed.

Examples of systems for detecting broadcast segments, such as commercial advertisement segments, which have some real-time detection capability include U.S. Pat. Nos. 4,420,769 entitled "Device for the Automatic Editing, at the Receiver, of Unwanted Program Material from Broadcast Electrical Signals" and 4,750,213 entitled "Method and System for Editing Unwanted Program Material from Broadcast Signals". U.S. Pat. No. 4,420,769 describes a system wherein a human operator identifies program segments to be eliminated from a broadcast signal causing a digital code word or signature for the segment to be stored in memory. Subsequently, if the same segment is encountered, the system automatically compares digitized portions of the received signal with the stored signatures to recognize the segment and then to blank out or otherwise eliminate the segment in real-time. One significant problem with this system is that a human operator must first detect program segments to be eliminated. Also, a significant amount of data processing is required to establish and compare the signatures in a reliable manner. U.S. Pat. No. 4,750,213, by the same inventor, sets forth improvements intended, in part, to reduce the processing time required. The system of U.S. Pat. No. 4,750,213 also includes a delay or other storage device for allowing a received signal to be delayed until a determination can be made by the human operator as to whether a particular segment of the received signal should be eliminated. If so, the received, delayed signal is output with the selected blanked out or otherwise eliminated. Although U.S. Pat. No. 4,750,213 may represent an improvement over U.S. Pat. No. 4,420,769, it shares the disadvantage that a human operator must detect program segments to be eliminated.

Another example of a system which has some real-time detection capability is U.S. Pat. No. 5,151,788 entitled "Method and Apparatus for Identifying and Eliminating Specific Material from Video Signals" wherein commercial advertisement broadcast segments are distinguished from program segments by the relative level of "activity" within the beginning of each segment. If the activity level is high, the segment is presumed to be a commercial advertisement. The system detects the amount of activity within the first few seconds of a segment following a blank frame and operates to mute or otherwise eliminate the remaining portions of the segment if the detected activity level is representative of a commercial advertisement. The system may control a VCR to stop recording for the remainder of the segment. The patent describes that the optimum time period during which the activity level should be detected is 8 seconds. One

disadvantage of the system is that the detection of commercial advertisements based upon an activity level is likely to be unreliable for many broadcasts and, even when the system does correctly detect a commercial advertisement, that detection does not occur until 8 seconds into the commercial advertisement.

Other references that relate to systems for detecting selected segments of a broadcast signal such as commercial advertisement segments of a television signal are described in the following references: U.S. Pat. No. 3,919,479 entitled "Broadcast Signal Identification System"; 4,229,765 entitled "Remote Audio and Brightness Control System for a Television"; 4,230,990 entitled "Broadcast Program Identification Method and System"; 4,259,689 entitled "Television Advertising Editing System"; 4,333,110 entitled "Television Editing System"; 4,390,904 entitled "Automatic Circuit and Method for Editing Commercial Messages from Television Signals"; 4,667,466 entitled "Broadcast Program Identification Method and Apparatus"; 4,697,209 entitled "Methods and Apparatus for Automatically Identifying Programs Viewed or Recorded"; 4,739,398 entitled "Method, Apparatus and System for Recognizing Broadcast Segments"; 4,752,834 entitled "Reciprocating Recording Method and Apparatus for Controlling a Video Recorder so as to Edit Commercial Messages from a Recorded Television Signal"; 5,019,899 entitled "Electronic Data Encoding and Recognition System" and European Patent Application Publication No. 0161512 entitled "Program Identification System".

Hence various techniques have been developed for detecting selected broadcast segments such as commercial advertisements within a television signal. None of the techniques described above, however, are effective for reliably and automatically detecting broadcast segments in real-time without the need of a human operator. According, it would be desirable to provide a simple, inexpensive system which reliably detects selected segments of a broadcast signal without requiring a human operator and wherein, either immediately or after some period of time, all or most selected segments can be detected in real-time.

#### SUMMARY OF THE INVENTION

In accordance with the invention, a method and apparatus, intended to be marketed under the mark Sound!Off™, is provided for identifying selected segments of a broadcast signal in real-time for the purpose of, for example, muting the video and audio portions of the signal during the selected segment. Hereinafter, "selected segment" refers to any selected portion of a broadcast signal including, for example, unwanted broadcast segments such as a commercial advertisement segments. In one embodiment wherein the broadcast signal is a television signal, the method includes the steps of detecting a signature pattern associated with the beginning of a received segment of the television signal and comparing the signature pattern to stored signature patterns representative of selected segments. If the signature pattern matches one of the stored signature patterns, the received segment is thereby immediately identified as being one of the selected segments and can be processed accordingly in real-time to, for example, mute the audio and video portions of the television signal during the received segment as the television signal is output to, for example, a television monitor. If the signature pattern of the received segment does not match any of the stored signature patterns, the received segment is analyzed to determine whether it is nevertheless one of the selected segments and, if so, its signature pattern is stored along with the stored signature patterns. The analysis to determine whether the received

segment is one of the selected segments even though its signature does not match any of the stored signatures may be performed by, for example, detecting the length of the received segment upon its completion and then determining whether the length of the received segment matches any of a pre-determined set of permissible lengths for selected segments. If so, the segment is identified as being a selected segment and its signature pattern is stored along with the other stored signature patterns such that, the next time the same segment is received, its signature will then match one of the stored signatures and therefore the received segment will be identified promptly at a selected segment and muted or otherwise altered in real-time. For an embodiment wherein the selected segments are commercial advertisement segments, the permissible lengths are, for example, 15 seconds, 30 seconds, and 60 seconds. The method may be performed by a television set or other device receiving a television signal such as a personal computer television (PCTV).

In one implementation, no stored signatures are initially provided. Hence, the first time any particular selected segment is encountered, it is not immediately identified as being a selected segment and therefore is not muted in real-time. However, the next time the same segment is encountered, the segment will be subject to immediate real-time muting because its signature will have been stored the first time it was received. Thereafter, as long as its signature remains stored, the segment will be subject to real-time muting whenever it is received. As more and more selected segments are encountered and their respective signature patterns stored, the more and more likely it becomes that any particular selected segment encountered while watching a television program will be promptly detected based upon its signature and muted in real-time. Hence, even though no stored signatures are initially provided, a database of signatures is soon developed. Also, in the exemplary implementation, the selected segment detection method may be performed by a television set even while the television set is otherwise not in use to thereby detect and record segment signatures in a background mode to quickly develop a database of signatures. Alternatively, a database of the signatures of common segments, such as common commercial advertisement segments, may be initially provided at the time of manufacture such that the common segments are thereby subject to immediate real-time muting even the first time received.

For many television broadcast systems, commercial advertisements appear in groups of two or more. When used in connection with such systems, the method of the invention preferably operates to not only mute or otherwise alter any detected commercial advertisements of a commercial advertisement group but also to mute or otherwise alter other unwanted broadcast segments appearing within the group, such as station breaks, news bulletins, public service announcements, etc. To this end, the method operates to identify the first of a group of commercial advertisements, then mutes or otherwise alters all segments during a predetermined minimum commercial advertisement group time period. The minimum group time period may be, for example, two minutes and twenty seconds. Hence, all segments appearing during the period are muted in real-time, including commercial advertisements for which the corresponding signature has not yet been stored (and which therefore would not otherwise be subject to immediate real-time muting) and segments that do not match the predetermined permissible lengths (and which therefore would not otherwise be subject to any muting whatsoever),

such as the aforementioned station breaks, news bulletins, and public service announcements. Thus the method is not limited to muting only those segments that have matching stored signatures. Rather, the method operates to mute or otherwise alter all segments appearing in a detected commercial advertisement group. However, only the signatures of segments having lengths matching the permissible selected segment lengths are stored. The signatures of a non-commercial advertisement segment, such as a station break, news bulletin, or public service announcement, are stored only if the length of the segment happens to match one of the predetermined permissible segment lengths.

Depending upon the implementation, the method identifies the beginning of a received segment by detecting pre-determined event markers which separate segments. When implemented for use in North America, the method may, for example, identify a period of one or more black frames combined with low audio as being an event marker representative of the beginning of a segment. When implemented for use in Europe, the method may further identify periods of one or more colored frames, such as blue frames, combined with low audio as being an event marker. When implemented for use in Japan, the method may instead identify a frame break combined with a period of low audio as being an event marker. In any case, once an event marker denoting the beginning of a broadcast segment is detected, the method promptly detects a signature from the segment for comparison against stored signatures. The signature may, for example, be a binary hash code representative of whether selected lines of a selected frame near the beginning of the segment exceed pre-determined luminance threshold levels. By detecting the signature near the beginning of the segments, the signature can be compared against stored signatures to allow the segment to be muted or otherwise altered in real-time before much of the received segment has been displayed. Preferably, the signature is based on frames appearing during the first one second of the segment.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference numerals identify correspondingly throughout and wherein:

FIG. 1 is a block diagram illustrating a television set incorporating a commercial advertisement detecting and muting system configured in accordance with an exemplary embodiment of the invention for detecting a commercial advertisement or other selected broadcast segment in real-time during a television broadcast and for muting video and audio portions of the television signal during the commercial advertisement;

FIG. 2 is a timing diagram illustrating exemplary groupings of consecutive commercial advertisement segments within a television broadcast signal analyzed by the system of FIG. 1 and illustrating event markers separating the broadcast segments;

FIG. 3 is a timing diagram illustrating the muting of luminance and audio portions of a television signal provided by the system of FIG. 1 for a pair of broadcast segments both identified as being commercial advertisements;

FIG. 4 is a timing diagram illustrating exemplary predetermined points in time following a first event marker wherein the system of FIG. 1 searches for a second event marker for the purpose of determining whether the first event marker corresponds to the beginning of a commercial



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advertisement segment and particularly illustrating a example wherein a second event marker is found at one of the predetermined points in time thereby indicating that the first event marker corresponds to the beginning of a commercial advertisement segment;

FIG. 5 is a timing diagram similar to that of FIG. 4, but wherein a second event marker is not found until after all of the predetermined points in time thereby indicating that the first event marker does not correspond to the beginning of a commercial advertisement segment;

FIG. 6 is a timing diagram similar to that of FIG. 4, but wherein a second event marker is found but not at one of the predetermined points in time thereby also indicating that the first event marker does not correspond to the beginning of a commercial advertisement segment;

FIG. 7 is a timing diagram similar to that of FIG. 4, wherein a second event marker is found at one of the predetermined points in time thereby also indicating that the first event marker corresponds to the beginning of a commercial advertisement segment but wherein yet another event marker, which must be ultimately ignored, is found between the others;

FIG. 8 is a flowchart illustrating an exemplary method performed by the system of FIG. 1 while the television set is in operation for detecting and muting commercial advertisements during a television broadcast wherein, among other features, a signature corresponding to an event marker is compared against a database of signatures corresponding to known commercial advertisements to determine whether the event marker corresponds to the beginning of a commercial advertisement segment;

FIG. 9 is a flowchart illustrating steps performed in furtherance of the method of FIG. 8 to read a segment signature corresponding to an event marker;

FIG. 10 is a representation of a single exemplary test frame of a television broadcast signal analyzed during execution of the steps of FIG. 9 and in particular illustrating exemplary signature test lines of the frame from which the signature is determined;

FIG. 11 is a representation of an exemplary bit string binary hash code signature corresponding to the frame of FIG. 10 and in particular showing exemplary bit values each representative of whether the average luminance of a corresponding test line of the frame exceeds a pre-determined threshold.

FIG. 12 is a flowchart illustrating steps performed in furtherance of the method of FIG. 8 to determine if an event marker nevertheless corresponds to the beginning of a commercial advertisement segment even through the signature corresponding to the event marker does not match any of the signature of the database;

FIG. 13 is a flowchart illustrating steps performed in furtherance of the method of FIG. 8 to store a signature in the database after it has been determined that the signature corresponds to a commercial advertisement segment;

FIG. 14 is a representation of a signature database accessed during execution of the steps of FIG. 13 wherein the database is configured as a RAM storing a single record of information, including broadcast date/time information, for each unique commercial advertisement signature to thereby allow records to be selectively overwritten as needed based, for example upon the broadcast date/time information.

FIG. 15 is a diagram similar to that of FIG. 14 but wherein the database is configured as a first-in first-out (FIFO) queue;

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FIG. 16 is a diagram similar to that of FIG. 14 but wherein the database is configured to store the signature and broadcast date/time information for each detected broadcast of each commercial advertisement to thereby allow verification that selected commercial advertisement are being broadcast on the proper days and at the proper times;

FIG. 17 is a flowchart illustrating a method for operating the system of FIG. 1 wherein the system is operated even while the television set is otherwise not in use to thereby detect and record commercial advertisement segment signatures in a background mode to thereby quickly develop a full database of signatures;

FIG. 18 illustrates a system wherein an apparatus performing the method described with reference to FIGS. 1-17 is provided external to a television set; and

FIG. 19 illustrates a PCTV configured with hardware or software for performing the method described with reference to FIGS. 1-17.

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Referring to the figures, exemplary embodiments of the invention will be described with reference to a system primarily directed toward detecting commercial advertisements. Initially, an overview is provided with reference to the block diagrams and timing diagrams of FIGS. 1-17. Then, further details of particular implementations are provided with reference to the flowcharts and block diagrams of FIGS. 8-19. The exemplary embodiments are primarily for use in detecting and muting commercial advertisements in a North American television broadcast signal wherein the advertisements are of fixed predetermined lengths and appear in groups. As will be described, the system can additionally mute other unwanted program material segments including station breaks, news bulletins etc. that appear in a detected commercial advertisement group. Moreover, the invention may be alternatively implemented for use with other television broadcast systems, such as those of Europe and Japan, and may be alternatively implemented to identify other types of selected segments of a signal besides commercial advertisements.

FIG. 1 illustrates a television set 100 configured with Sound!Off™ and having a receiver 102 and a monitor 104. Television receiver 102, which includes a television tuner, receives an input broadcast television signal from an antenna 106 or from any other appropriate input source such as a coaxial cable input (not separately shown) and outputs a received television signal for eventual display by monitor 104. In this exemplary implementation, the received television signal is an analog NTSC signal including audio, luminance and chrominance components. In other implementations, the television signal is a PAL or SECAM signal or digital signal such as an HDTV signal. Monitor 104 displays the video portions of the television signal and plays the audio portions through speakers (not separately shown).

Rather than routing the received television signal directly to the monitor for display, the television signal is first routed through a commercial advertisement detecting and muting system 108 which operates in real-time to detect target or selected segments of the television signal and to mute selected components of the television signal during those segments prior to output to monitor 104. In the exemplary implementation, the selected segments are commercial advertisements. The muted components of the television signal are the audio and luminance components. As noted, in other implementations, other selected segments may be

detected or other components of the signal may be muted or otherwise processed. Commercial advertisement detecting and muting system 108 is, in the exemplary implementation, configured as a single plug-in module having both analog and digital electronics for plugging directly into an otherwise conventional television set. In other implementations, described below, the commercial advertisement detecting and muting system is an after-market device configured for use with a television set having audio and video outputs or is hardware or software provided within a PCTV.

Detection of commercial advertisement segments is achieved as follows. Within detecting and muting system 108, the television signal is first routed through a broadcast segment event marker and signature detector 110 which detects event markers separating broadcast segments of the television signal and, for each segment, detects a signature. A broadcast segment may be a commercial advertisement segment or a portion of a television program, movie, news show, "infomercial" etc. hereinafter referred to as program segments. As noted, the broadcast segments are separated by event markers. In the exemplary implementation which is for use in North America, an event marker is a period of one or more black frames combined with low audio. When implemented for use in Europe, the event marker may also be a period of one or more colored frames, such as blue frames, combined with low audio. When implemented for use in Japan, an event marker is a frame break combined with a period of low audio extending from slightly before to slightly after the frame break.

In any case, commercial advertisement segments may be distinguished from program segments in that commercial advertisement segments almost always appear in groups of two or more and are each of one or more relatively short pre-determined lengths such as 15 seconds, 30 seconds and 60 seconds. The groups are typically at least two minutes long. FIG. 2 illustrates an exemplary television signal having program segments 112, 114, and 116 followed by groups of commercial advertisement segments 118, 120 and 122, respectively, with each segment separated by an event marker 124. Commercial advertisement group 118 includes two commercial advertisement segments of 60 seconds each. Group 120 includes two commercial advertisement segments of 30 second and one of 60 seconds. Group 122 also includes two 60 second commercial advertisement segments. Although not shown in FIG. 2, commercial advertisement groups may additionally include other segments such as station breaks, news bulletins, public service announcements etc., which are typically not of the same lengths as commercial advertisements, i.e. the other segments are not 15, 30 or 60 seconds long. If other segments are included, the group is typically at least two minutes and twenty seconds long. The manner by which the non-commercial advertisement segments within a group are processed will be described below.

Each unique broadcast segment has a unique signature. The signature may be any unique characteristic of the segment that can be used to distinguish one segment from another. As will be described below, in the exemplary implementation, the signature is a bit string hash code representative of whether each of a set of selected lines of a selected frame of a received segment has an average luminance level that exceeds a predetermined threshold. The selected frame may be, for example, the tenth frame following the completion of the event marker marking the beginning of the segment. The selected lines may be, for example, the first 64 odd lines of the frame beginning at line 23. Other signatures may alternatively be employed.

Referring again to FIG. 1, as each broadcast segment is received, the signature for that broadcast segment is detected in real-time by detector 110. The signature is routed to a control unit 126 which accesses a signature memory unit 128 to determine whether the detected signature matches any of a set of signatures stored therein known to correspond to commercial advertisement segments. If the detected signature matches one of the stored signatures, then the control unit identifies the broadcast segment from which the signature was taken as being a commercial advertisement segment and forwards a mute control signal to a video/audio mute unit 130. The mute unit also receives the television signal directly from detector 110. In response to the mute control signal, the mute unit mutes the audio and luminance components of the television signal during the commercial advertisement segment and forwards the muted signal to monitor 104. The mute control signal is maintained during the entire commercial advertisement segment. In the exemplary implementation, the signature memory unit stores, for each commercial advertisement signature, the length or duration of the segment. The control unit reads this information and thereby knows when to terminate muting. In other implementations, muting is terminated upon detection of a next event marker. The former technique is preferred because event markers may coincidentally appear in the middle of a commercial advertisement segment. If muting is always terminated upon detection of a next event marker, muting could erroneously be removed in the middle of a commercial advertisement.

Hence, the system mutes the output signal during a detected commercial advertisement segment. Additionally, the system may continue the mute throughout an entire commercial advertisement group containing the detected commercial advertisement segment. To this end, the system determines when the commercial advertisement group began and continues muting for at least some minimum predetermined time period, such as two minutes, following the beginning of the group. In this manner, non-commercial advertisements of the group are muted as well as any commercial advertisements of the group not having a previously stored signature. The manner by which the system determines the beginning of a commercial advertisement group for the purposes of muting the entire group will be described below.

By "muting" it is meant that the amplitudes of the audio and luminance components of the output signal are reduced such that the viewer of monitor 104 sees a dimmed image and hears reduced audio levels. FIG. 3 is a timing diagram illustrating the muting of luminance 132 and audio 134 components of a television signal during two consecutive detected commercial advertisement segments between a pair of un-muted program segments. As can be seen, the levels of both the audio and luminance components are ramped down immediately after the beginning of the first commercial advertisement segment and are ramped up immediately after the end of the second commercial advertisement segment. Mute unit 130 (FIG. 1) also superimposes an audio chime over the audio signal as the audio signal is increased to its pre-mute level. The chime is provided to alert a viewer that the muted commercial advertisement segments have completed. This is particularly desirable if the next program segment begins with a silent audio track, perhaps accompanied by program credits. Without the chime, the viewer, whose attention may be elsewhere, might not realize that a program segment of interest is beginning. In other implementations, the chime may also be produced at the beginning of each muted commercial advertisement segment.

Referring again to FIG. 1, if the signature detected by detector 110 does not match any of the stored signatures of memory unit 128 and the system is not currently muting an entire commercial advertisement group, then no mute control signal is provided to mute unit 130 and the television signal is thereby forwarded without modification by the mute unit to monitor 104. In this manner, program segments remain un-muted. More specifically, when a program segment is received, its signature is detected and compared against those of memory unit 128. Because the memory unit only stores segments corresponding to commercial advertisement segments or other selected broadcast material, the program segment signature will not match any stored segment and no muting will therefore occur during the program segment.

Hence, commercial advertisement detecting and muting system 108 operates to mute in real-time any broadcast segment having a signature matching one of the signatures of memory unit 128. It is, of course, possible that a commercial advertisement will be received for which the signature had not previously been recorded in memory unit 128 and the commercial advertisement will therefore not be muted (unless it is part of an entire group of commercial advertisements being muted). Indeed, in the exemplary implementation, when the system is initially activated, the memory unit has no signatures whatsoever stored therein. Accordingly, detecting the muting system 108 is provided with a non-real-time means for determining whether a broadcast segment, having a signature that does not match any signature recorded in the database, nevertheless is a commercial advertisement segment. Once a determination is made that a broadcast segment is a commercial advertisement segment or other selected segment, the signature of the segment is added to the database such that the segment can be muted in real-time the next time it is encountered.

The determination of whether a broadcast segment is a commercial advertisement segment or other selected segment, assuming that its signature does not match a stored signature, is achieved as follows. As noted above, and as illustrated in FIG. 2, commercial advertisement segments are distinguishable from program segments in that commercial advertisement segments almost always appear in groups of two or more and are each of one or more relatively short pre-determined durations such as 15 seconds, 30 seconds and 60 seconds. Accordingly, if an event marker corresponds to the beginning of a commercial advertisement segment, a second event marker should occur after one of the pre-determined periods of time following the first event marker. If an event marker corresponds to the beginning of a program segment, a second event marker will not likely occur after one of the pre-determined periods of time following the first event marker.

Hence, if a second marker occurs, for example, 15, 30 and 60 seconds following a first event marker, a determination is made that the segment between the first and second event markers is therefore probably a commercial advertisement or other selected segment and the signature detected following the first event marker is added to the signatures stored in memory unit 128 (FIG. 1). If a second marker does not occur at 15, 30 or 60 seconds following a first event marker, a determination is made that the segment between the first and second event markers is therefore probably not a commercial advertisement segment and the signature detected following the first event marker is merely discarded.

In practice, for North American broadcast systems, the lengths of commercial advertisements often deviate slightly from the standard 15, 30 and 60 second durations.

Accordingly, the system searches for subsequent event markers within a range of time centered around each expected event marker time. For a 30 second commercial advertisement, the system may search, for example, for event markers occurring 28.9 to 32 seconds following a previous event marker.

In any case, if a determination is made that a broadcast segment is a commercial advertisement, then the next time the same commercial advertisement segment is received the following occurs. The signature of the commercial advertisement segment is again detected by detector 110 and compared against those of memory unit 128. The newly detected signature matches the previously stored signature and the commercial advertisement segment is therefore muted in real-time. In this manner, the system builds a database of commercial advertisement segment signatures and each commercial advertisement segment is typically displayed only once in its un-muted form. Thereafter, as long as the signature of the commercial advertisement segment remains in the database, the segment is detected and muted in real-time. Hence, even if the signature database of memory unit 128 is initially empty, a database of commercial advertisement signatures is developed and soon all or most commercial advertisements that are commonly shown are detected and muted. Of course, it is possible for a non-commercial advertisement segment of a desired television program to be 15, 30 or 60 seconds long such that its signature will be added to the database along with those of commercial advertisements. Hence, the next time the same television program is received the segment will be muted under the assumption that it is a commercial advertisement. This is not a particularly significant problem. The viewer merely over-rides the mute and continues to view the program. Moreover, television programs are not typically viewed very frequently and, as will be described below, the system may be configured to erase signatures not frequently encountered such that, the next time the same television program is viewed, the signature of that segment of the program may have already been erased. Also, it is possible for news bulletins, public service announcements etc. to also be 15, 30 or 60 seconds long such that their signatures will be added to the database for future muting. Again, this is not a significant problem. Indeed, if the news bulletins, public service announcements etc. are broadcast frequently, the viewer may consider their subsequent muting to be quite advantageous.

As noted, a determination of whether a segment constitutes a commercial advertisement segment even though its signature does not match a stored signature is performed based upon the time periods separating event markers. FIGS. 4-7 illustrate various example of event marker groupings within a television signal to help illustrate the manner by which this determination of a commercial advertisement segment is performed.

FIG. 4 illustrates an example wherein a second event marker occurs at one of the pre-determined time periods following a first event marker. More specifically, FIG. 4 shows a pair of event markers 133 and 135 occurring 60 second apart. Shortly after first event marker 133 is detected, the signature for the program segment beginning at that event marker is temporarily recorded. Then, a determination is made as to whether a second event marker occurs at 15, 30 or 60 seconds following the first event marker. In the example of FIG. 4, second marker 135 is detected 60 seconds from the first marker. Accordingly, shortly thereafter, the temporarily recorded signature is saved i.e. it is stored in memory unit 128 (FIG. 1) along with any other

pertinent information such as the duration of the corresponding commercial advertisement as determined by the time period between the first and second event markers. If the second marker had alternatively occurred at either 15 or 30 seconds following the first event marker, the signature

With further reference to FIG. 4, it should be noted that the detection of second event marker 135 also triggers a temporary recording of the signature of the segment beginning at the second event marker. This signature is compared with those stored in the memory unit (FIG. 1). As with the first signature, if a match is detected then the broadcast segment beginning at the second event marker is immediately muted and if no match is detected, then the signature is temporarily recorded until a determination can be made whether the broadcast segment beginning at the second event marker is nevertheless a commercial advertisement segment.

FIG. 5 illustrates an example wherein a second event marker does not occur at one of the pre-determined time periods following a first event marker. More specifically, FIG. 5 shows a pair of event markers 136 and 138 occurring more than 60 seconds apart. Shortly after first event marker 136 is detected, the signature for the broadcast segment beginning at that event marker is temporarily recorded. Then, a determination is made as to whether a second event marker occurs at 15, 30 or 60 seconds following the first event marker. In the example of FIG. 5, no event marker is detected at either 15, 30 or 60 seconds following the first event marker. Accordingly, shortly after the time of event marker 136 plus 60 seconds, the temporarily recorded signature is discarded. (Again it should be noted that the detection of the second event marker also triggers a temporary recording of the signature of the segment beginning at the second event marker and processing of that signature proceeds.)

FIG. 6 illustrates an example where a pair of first and second event markers 140 and 142 are separated by less than 60 seconds but where second event marker 142 does not occur at one of the pre-determined intervals. Hence, the first marker does not correspond to the beginning of a commercial advertisement or other selected segment. It should be noted that the determination that the first marker does not correspond to a commercial advertisement is not made until 60 seconds following the detection of the first event marker. Accordingly, the temporarily recorded signature recorded following the first event marker is not discarded until after the 60 second mark. The detection of the second event marker in the interim does not terminate the search for additional event markers based upon the first event marker. That search continues until at least 60 seconds from the first event marker. Also, the detection of the second event marker triggers a temporary recording of a second signature and a contemporaneous search for additional event markers following the second event marker at 15, 30 or 60 second intervals.

FIG. 7 illustrates an example where a pair of event markers 144 and 146 are separated by 30 seconds. Hence, the first marker corresponds to a commercial advertisement, and a signature temporarily recorded shortly after the first event marker is stored along with other pertinent information in the database of memory unit 128 (FIG. 1). It should be noted that the determination that the first and second event markers 144 and 146 correspond to the beginning and end of a commercial advertisement is made shortly after second event marker 146 is detected and is not deferred until 60 seconds from the first event marker. Also, FIG. 7 shows

another event marker 148 occurring between event markers 144 and 146 but not at one of the predetermined time periods. The detection of the additional event marker in the interim between event markers 144 and 146 does not terminate the search for an additional event marker at any of the predetermined time periods from the first event marker. The detection of event marker 148 however triggers a temporary recording of another signature immediately thereafter and a contemporaneous search for event markers following at 15, 30 or 60 second intervals.

Hence, FIGS. 6-7 illustrate that more than one signature may be temporarily recorded at any given time and that amplitude contemporaneous searches may be performed for subsequent event markers with one search for each event marker. Indeed, in the exemplary implementation, each event marker, for which the corresponding signature is not found in the signature database, triggers a search for an additional event marker at one of the pre-determined intervals thereafter. As each search may last as long as 60 seconds during which time a number of additional event markers may be encountered, a number of signatures may need to be simultaneously temporarily stored and coordinated. Additionally, the time that each event marker is detected is recorded to allow calculation of the various time intervals. Accordingly, a temporary signature and event marker time memory unit 150 is provided in connection with control unit 126 of FIG. 1 for storing the temporary signatures and the time of the event marker corresponding to each temporarily stored signature. Signatures stored therein are either erased after 60 seconds, if no event marker is detected at any of the pre-determined intervals, or transferred to the signature memory unit 128, if an event marker is detected at any of the pre-determined intervals. In the exemplary embodiment, control unit 126 of FIG. 1 coordinates storage of information within temporary memory unit 150 and performs the various searches for additional event markers. In this regard, the control unit may be a microprocessor pre-programmed with appropriate software to coordinate the aforementioned operations. Alternatively, the control unit may be a dedicated integrated circuit pre-configured with appropriate hardwired logic to coordinate the operations. Other appropriate devices may be employed as well.

Thus, by detecting various event marker times, the system can determine whether a segment, which does not have a matching stored signature, is nevertheless a commercial advertisement segment. Hence, each received commercial advertisement is detected either immediately via a signature match or at the end of the segment via an event marker analysis. Once a commercial advertisement is detected, the system determines whether it represents the beginning of a new commercial advertisement group and, if so, muting is maintained for at least two minutes thereafter, regardless of whether the subsequent segments have matching signatures in the database. In one implementation, this is achieved as follows. For any detected commercial advertisement segment, if no other commercial advertisement segment preceded it during the previous 60 seconds, or some other predetermined minimum period of time, then the system identifies the detected commercial advertisement segment as being the first of a new group. If it were not the first of a new group, then a previous commercial advertisement segment of the same group would at least have terminated at some point during the preceding 60 seconds. (This assumes that no two consecutive commercial advertisement segments of a common group are ever separated by more than 60 seconds of non-commercial advertisement segments such as station breaks etc. In most cases, this assumption is correct.) Once

the system identifies the first commercial advertisement of the group, muting is initiated and maintained for at least two minutes, or some other predetermined minimum group time period, from the beginning of that commercial advertisement. Notably, this determination is made regardless of whether the commercial advertisement was detected via signature match or event marker analysis. If detected by signature match, the determination is made during the reception of the commercial advertisement. If detected via event marker analysis, the determination is not made until the end of the segment. In either case, the duration of continuous muting is calculated based on the beginning of the first commercial advertisement segment of the group. As noted, muting is maintained for some predetermined period of time representative of the minimum duration of a group of commercial advertisements such as two-minutes. Any particular group may be longer in duration and continuous group-based muting may therefore end during the group. Signature-based muting, however, will continue for any remaining commercial advertisements of the group that have matching signatures in the database. Hence, the remaining advertisements of the group will not necessarily be un-muted. Other techniques for detecting the beginnings and predicting the endings of commercial advertisement groups may alternatively be employed.

With reference to the remaining Figures, further details of exemplary and alternative method and apparatus embodiments of the invention will be described.

FIG. 8 is a flowchart summarizing steps performed by the commercial detection and muting system of FIG. 1 or by any other appropriate system for performing commercial advertisement detection and muting. As many of these steps have already been describe above, only additional aspects of the detection and muting technique will be described in detail. Initially at step 200, a television broadcast signal is received. The television signal is searched to detect event markers, step 202. If an event marker is not detected, step 204, the television signal is merely output at step 206 perhaps to a display device such as monitor 104 (FIG. 1). Steps 200, 202, 204 and 206 are repeated until an event marker is detected at step 204 triggering the beginning of a broadcast segment evaluation process for the broadcast segment beginning at the detected event marker, step 208. As will be described below, the broadcast segment evaluation process operates to determine whether the broadcast segment beginning at the corresponding event marker is a commercial advertisements and if so mutes the output of the television signal during the commercial advertisement. After the broadcast segment evaluation process has been triggered for that event marker, step 206 is again executed to continue outputting the television signal. Hence, the television signal is not stored or otherwise delayed but is immediately output in real-time. The broadcast segment signature evaluation process is performed shortly after detection of the event marker such that very little of the television signal is output before a determination of whether the signal needs to be muted is achieved.

Steps 220-206 are repeatedly performed to search the television signal for additional event markers. Each newly detected event marker triggers a separate broadcast segment signature evaluation process for the broadcast segment beginning at that event marker. If part of the system performing the method of FIG. 8 is implemented as a software program, the individual broadcast segment evaluation processes may be, for example, separate and distinct software processes running on a microprocessor or may merely be separate logic threads within a single software process. They

are described herein as separate processes primarily to help clarify that contemporaneous searches for subsequent event markers may need to be performed for each of a set of consecutive event markers and not to imply any particular architecture by which the method of FIG. 8 must be implemented.

Beginning at step 210, one broadcast segment evaluation process triggered at step 208 is set forth. Step 210 is shown connected to step 208 by a dashed line to indicate that the broadcast segment evaluation process proceeds independently of, and contemporaneously with, steps 200-206. At step 212, the signature corresponding to the current broadcast segment is read from the television signal. Additional details of step 212 are set forth in FIGS. 9-11 and will be described below. At step 214, the signature is compared against stored signatures in a database of signatures known to correspond to commercial advertisements or other unwanted broadcast material. If there is no signature match, step 216, then step 218 is performed to determine whether the current broadcast segment nevertheless comprises a commercial advertisement segment and, if so, what the length of the commercial advertisement segment is in seconds. Additionally details of step 218 are set forth in FIG. 12 and will be described below. If the current segment is determined to not be a commercial advertisement at step 220, then step 222 is executed to end the broadcast segment evaluation process. If, however, the current segment is determined to be a commercial advertisement, step 224 is executed to store the signature of the current segment read at step 212 in the database such that, when the same commercial advertisement segment is encountered again, the commercial advertisement can be detected in real-time. As noted above, the determination of whether a broadcast segment comprises a commercial advertisement segment may take up to 60 seconds from the event marker defining the beginning of the segment. Additional details of step 224 are set forth in FIGS. 13-16 and will be described below.

At step 224, in addition to storing the signature for the current broadcast segment, the system also stores the length of the commercial advertisement and other pertinent information such as the latest date and time of day (date/time) of the broadcast of the segment. The length is used to determine how long to mute the output signal if the same commercial advertisement is again encountered. The latest date/time of broadcast can be employed to selectively erase signatures from the database based upon how recently the signatures had been encountered. More information regarding the content and purpose of information stored in the database along with the signature will be described in greater detail below. After the database is updated at step 224, step 225 is performed to determine whether the detected commercial advertisement is the first of a group and if so continuous group-based muting, described above, is performed until at least the end of the minimum pre-determined group time period, assuming no user over-ride. Then, step 222 is executed to end the current broadcast segment evaluation process.

Hence steps beginning at step 218 are performed only if the signature of the current broadcast segment does not match any in the database as determined at step 216. If there is a signature match at step 216 indicating that the current broadcast segment is a commercial advertisement, the system first determines whether the commercial advertisement is the first of a group, step 226, and then begins muting the output television signal, step 227, by using a mute control signal in the manner described above with reference to FIGS. 1 and 3. Accordingly, television signals output at step



208 are muted and will remain muted until the mute control signal is deactivated. If the advertisement is the first of a group, the muting will ultimately continue until the end of the predetermined minimum group time period as described above, assuming no user over-ride. If not, muting will continue until the end of the advertisement, again assuming no over-ride. The length of the commercial advertisement is then read from the database, step 228, such that system can determine the end of the current commercial advertisement segment. Hence, if a previously triggered group-based muting terminates during the current segment, the system will continue to mute until the end of the segment. At step 230, the system updates the parameters stored with the signature, such as the latest date and time of broadcast. Then, at step 232, the muting is terminated either upon user over-ride or upon the latter of the completion of the current commercial advertisement segment and the completion of the current group (as determined by the minimum predetermined group time period) if group-based muting had been triggered. The current commercial advertisement segment, as with all segments, end with an event marker which is detected at step 204 triggering another broadcast segment evaluation process.

Hence, FIG. 8 illustrates that broadcast segment evaluation processes are triggered upon the detection of each event marker. As discussed above, each broadcast segment evaluation process may take up to 60 seconds to determine whether the broadcast segment beginning at the event marker triggering the process is a commercial advertisement or not. During that period of time a number of other event markers may be detected and a broadcast segment evaluation process triggered for each one. Hence, a number of evaluation processes may proceed simultaneously. The resolution of one process may moot or obviate some of the latter-triggered processes. For example, if a first triggered process determines that the corresponding broadcast segment is a commercial advertisement, then any event marker detected before the end of the broadcast segment thereby occurred during the commercial advertisement and therefore do not represent the beginnings of unique commercial advertisements, and the broadcast segment evaluation processes triggered thereby may be terminated. In other words, if a commercial advertisement is detected because a pair of event markers are found to be exactly 60 seconds apart, any other event markers detected during that 60 second period thereby occurred during the 60 second commercial and therefore can be ignored. On the other hand, if after 60 seconds a first triggered process determines that a first event marker at the beginning of that 60 second period is not the beginning of a commercial advertisement, then any event marker detected after that first event marker may itself represent the beginning of a commercial advertisement segment, and the broadcast segment evaluation processes triggered thereby may not be terminated until the situation is further resolved. Conversely, if a second triggered process determines that the corresponding broadcast segment is a commercial advertisement, then any event markers detected before the beginning of that broadcast segment occurred before the commercial advertisement began and therefore do not themselves represent the beginnings of unique commercial advertisements, and any broadcast segment evaluation processes triggered thereby may be terminated. For clarity in illustrating the basic process of the invention, the details of the logic by which the resolution of one broadcast segment evaluation process affects others are not set forth in FIG. 8 but may be readily incorporated within a computer program or other logic device configured for implementing the

method of the invention in accordance with the teachings provided herein.

With reference to FIGS. 9-16 details of exemplary implementation of some of the steps of FIG. 8 will now be described.

As noted, step 212 of FIG. 8 operates to read a signature corresponding to an event marker from the broadcast signal. Any of a wide variety of techniques for defining the signature of a broadcast segment and for reading and recording the signature may be employed. FIG. 9 sets forth one exemplary technique for reading a signature corresponding to an event marker from a broadcast signal. At step 236, the system waits a pre-determined number of frames from the completion of the event marker. The system may wait, for example, 10 frames or the equivalent period of time. At step 238, the system then records the current frame, e.g., the system takes a snap shot of the tenth frame, hereinafter referred to as the test frame. An exemplary test frame 240 is illustrated in FIG. 10. At step 242, the system determines, for each of a preselected set of signature test lines of the test frame, the average luminance level of the lines. The signature test lines may be, for example, the first 64 odd lines of the frame beginning at line 23 or perhaps the 5th, 10th, 15th, etc. lines. A few exemplary signature test lines are identified in FIG. 10. The average luminance level of each line may be determined, for example, by routing the luminance signals for those lines through circuitry (not shown) configured to generate a test voltage level representative of the average voltage level of the luminance signal. At step 244 a determination is made, for each signature test line, as to whether the average luminance level for that line exceeds a pre-determined threshold. This determination may be made, for example, by defining the threshold level in terms of a threshold voltage level and comparing the test voltage level with the threshold voltage level. At step 246, the system assigns a bit value of 1 to each line exceeding the threshold luminance level and a bit value of 0 otherwise. Of course, opposite bit values could alternatively be employed. At step 248, the bit values are concatenated together yielding a single binary bit string hash code signature with one bit per test line of the test frame. An exemplary bit string 250 is set forth in FIG. 11. Execution then returns to step 212 of FIG. 8 via step 249 where the signature is compared against those in the database.

Hence, a bit string signature is evaluated based upon the average luminance level of selected lines of one selected frame following the event marker. Any bit string of suitable length may be employed. If too few test signature lines are selected yielding a short bit string, the bit string may not have sufficient bits to uniquely identify the broadcast segment. Accordingly, it is preferred that at least 32 signature test lines are selected yielding a bit string of at least 32 bits. With 32 bits, it is reasonably unlikely that test frames from different program segments will have the same bit string and hence, the bit string can be used to uniquely identify each unique broadcast segment. Also, a test frame occurring fairly promptly after the event marker should be selected. If a test frame is selected that occurs too late after the event marker, the system will not be able to promptly determine whether the signature of the test frame matches any of the recorded signatures and will therefore not be able to promptly begin real-time muting. Hence, it is preferred that the test frame occur no longer than about one second after the event marker. In alternative implementations, signature test lines may be drawn from two or more separate test frames.

Thus FIGS. 9-11 set forth exemplary techniques for reading a signature wherein a bit string is generated based

upon whether average luminance levels of selected signature test lines of a selected test frame exceed a threshold level. Of course, the same test signature lines, the same test frame and same threshold level must be employed each time to ensure that the same bit string is generated every time the same broadcast segment is encountered. Hence, care should be taken in detecting and comparing signatures to compensate for skew or other factors in the television signal. Details of one possible system for detecting and comparing signatures which addresses skew and other factors is set forth in U.S. Pat. No. 5,504,518 summarized above.

If the television signal is digital, average luminance levels need not be employed. Rather, the signature is simply based on selected bits within one or more selected digital frames. Skew and other related problems are also avoided or more easily overcome.

As noted, step 218 of FIG. 8 operates to determine if the current broadcast segment nevertheless corresponds to the beginning of a commercial advertisement even though the signature of the segment beginning with the event marker triggering the evaluation process does not match any in the database. FIG. 12 sets forth one exemplary technique for making the determination. An overview of the technique was provided above in connection with FIGS. 4-7. At step 252 a set of predetermined time periods based on standard commercial advertisement lengths are read from a memory. Examples include 15 seconds, 30 seconds, 60 seconds. At step 254, the system sets appropriate times to begin waiting each of the pre-determined time periods. At step 256, the system determines whether a second event marker occurs at any of the pre-determined time periods following the first event marker. For example, the system first waits 15 seconds from the time of the first event marker and detects whether the television signal includes an event marker at that point in time. If not, the system waits until 30 seconds from the first event marker and so on. If a second event marker is detected at any of the predetermined times, step 258, then step 260 is performed wherein the broadcast segment beginning at the first event marker is identified as a commercial advertisement. At step 262, the system determines the length of the commercial advertisement by comparing the time the second event marker was detected with that of the first marker. Execution thereafter returns through step 264 to step 218 of FIG. 8. If at step 258, no event marker is found at any of the pre-determined time periods following the first event marker, then step 266 is performed wherein the broadcast segment starting at the first event marker is identified as not being a commercial advertisement segment and again execution returns to step 218 of FIG. 8.

Step 224 of FIG. 8 operates to store the signature and other pertinent information in the database if the broadcast segment is found to be a commercial advertisement. The database, however, may be full. A determination then needs to be made as to which previously stored signatures, if any, should be overwritten to make room for the newly recorded signature. FIGS. 13-16 set forth details of one exemplary technique. At step 268, the system determines whether the database is full and if not, step 270 is performed to store the signature, the length of the commercial advertisement for the segment corresponding to the signature and the date/time the event marker marking the beginning of the commercial advertisement was detected. Other information may also be recorded for the purpose of allowing the system to intelligently decide which records to erase as the database becomes full. For example, if the system is configured to detect commercial advertisements even while the television set is otherwise not in use (as will be described in greater

detail below with reference to FIG. 17), the system also stores an in-use weighting factor, which may be a single bit value, indicating whether the commercial advertisement was detected during a period of time when the television was not otherwise in use or whether it was detected while the television was in use. The system may also increment a counter identifying the number of times the commercial advertisement is encountered.

FIG. 14 sets forth an exemplary database (for use as signature memory until 128 of FIG. 1) having, for each unique signature stored therein, entries for the first broadcast date/time, the latest broadcast date/time, the number of times the commercial advertisement is encountered and the in-use weighting factor. When the signature entry is initially recorded (step 224 of FIG. 8), the first date/time and the latest date/time are the same, the number of broadcast is one and the in-use weighting factor is either set to 1 or 0 depending upon whether the television set is currently in use.

Within FIG. 13, if the database is found to be full at step 268 then step 272 is performed wherein the system selects one of the previously stored records in the database to be overwritten based upon, for example, the latest date/time that the previous signatures were encountered, the first date/time the signatures were encountered, etc. For example, depending upon system pre-programming, the system may overwrite whichever entry was least recently written to the database as indicated by the latest date/time of broadcast information. This technique has the advantage of overwriting signatures corresponding to commercial advertisements not encountered recently and thereby keeping the database up to date. If such is the case, no further information need be recorded along with the signature other than the latest date/time which must be updated upon each detection of the signature (see step 230 of FIG. 8). As another example, the system may overwrite whichever signature record has the lowest frequency of occurrence. In such a case, the system calculates a frequency of occurrence based upon the first date/time of entry, the latest date/time of entry and the number of broadcasts encountered. This technique has the advantage of overwriting signatures not frequently encountered even though the signature may have been recently encountered.

As another example, the system may overwrite whichever signature simply has the least number of encountered broadcasts as represented by the number of broadcasts counter. To ensure that newly stored signatures are not immediately overwritten the system may also look at the earliest time of broadcast and overwrite a signature only if it was recorded some minimum amount of time earlier.

If the system is configured to search for commercial advertisements even while the television set is not otherwise in use, the system may be configured to overwrite signatures encountered during times that the television was not otherwise in use first before overwriting signatures encountered while the television set was in use. This has the advantage of eliminating signatures that correspond to commercial advertisements not ordinarily encountered while the viewer of the television set typically watches television. In this regard, whenever a signature is first encountered, the system simply determines whether the television set is on and if so, sets the in-use bit to 1 if the set is on and 0 otherwise. Thereafter, if the signature is encountered while the in-use bit is set to 0 and while the television set is on, the in-use bit is re-set to 1. Once the in-use bit is set to 1 it is not reset to 0 until the record is erased. Hence, the in-use bit indicates whether the signature has been encountered at least once

while the television set was on. In any case, if a signature record needs to be overwritten, records having in-use bits set to 0 are overwritten first before any records having in-use bits is set to 1.

In yet another example, the system may overwrite which-  
ever entry was first written to the database as indicated by  
the first date/time of broadcast information. If such is the  
case, the memory is preferably implemented, as illustrated in  
FIG. 15, as a FIFO 274 such that no explicit date/time value  
need be stored. If implemented as set forth in FIG. 14, the  
memory is preferably a RAM.

In yet another implementation, illustrated in FIG. 16, the  
database is capable of storing multiple records per signature.  
More specifically, database 276 of FIG. 16 stores a record  
identifying the broadcast date/time of each detection of each  
commercial advertisement signature. Accordingly the data-  
base maintains a record of when each commercial advertise-  
ment is broadcast. Exemplary signatures #1<sub>1</sub>–#1<sub>N</sub> and  
#2<sub>1</sub>–#2<sub>M</sub> are shown. Periodically, the contents of the data-  
base are output to provide a list, perhaps for broadcast  
verification purposes, of the date and time of each broadcast  
of each commercial advertisement. Preferably, the database  
is of sufficient size such that records do not need to be  
overwritten prior to outputting the date/time broadcast infor-  
mation.

As noted above, in one implementation the system is  
configured to operate in a background mode to detect  
commercial advertisements and record the corresponding  
signatures even while the television set is not otherwise in  
use. This is provided in part to allow the system to quickly  
build a database of commercial advertisements signatures  
such that, when the television set is in use, there is a higher  
probability that commercial advertisements encountered  
will be muted. The background mode is particularly advan-  
tageous for use when the system is initially activated with  
few, if any, pre-stored signatures.

FIG. 17 sets forth a method for implementing the back-  
ground mode. Initially, at step 300, commercial detecting  
and muting system 108 (FIG. 1) is powered-up with audio  
and video outputs to television monitor 104 (also FIG. 1)  
disabled. At step 302, the database is examined to determine  
whether it is complete. Depending upon pre-programming,  
the database may be regarded as being complete if it is full  
or perhaps if it holds some threshold number of signature  
records. Assuming that the database is complete, then step  
304 is performed where the system waits for user input to  
turn the television monitor on. Hence, no background pro-  
cessing is initiated. Once the monitor is activated, the audio  
and video are enabled, step 306, and the system begins  
receiving a broadcast signal, step 308. As with the basic  
method of FIG. 8, the system searches for event markers,  
step 310, and if event markers are detected, step 312, the  
system begins a broadcast segment evaluation process to  
determine whether the broadcast segment is a commercial  
advertisement, step 314. Details of the broadcast segment  
evaluation process are set forth in FIGS. 8–16 and have been  
described above. Then, regardless of whether an event  
marker has been detected or not, step 316 is performed to  
output the received broadcast signals to the monitor. Since  
audio and video had previously been enabled, the broadcast  
signal is thereby displayed by the television monitor,  
although perhaps muted if currently displaying a detected  
commercial advertisement. At step 318, the system deter-  
mines whether the user has de-activated the television  
monitor and, if not, steps 308–318 are again performed. In  
this manner, steps 308–318 are repeated in a loop until the  
television monitor is turned off—at which time step 320 is

performed to again disable audio and video. At step 302,  
the database is again examined to determine if it is still complete  
and if so the system waits at step 304 until the user again  
activates the television monitor. Step 302 is performed  
following step 320 because, in some implementations, the  
user is provided with the capability of clearing all or part of  
the commercial advertisements signature database while  
operating the television set. Hence, the commercial adver-  
tisement database may no longer be complete.

If at step 302, the database is not complete, either because  
the system is newly installed and has not yet built up a  
complete database or because the user has cleared the  
database, execution proceeds to step 322 where the system  
determines whether the user has activated the television  
monitor and if so execution proceeds to step 306 and  
following for non-background commercial advertisement  
detection processing as already described. If the user has not  
activated the television monitor, execution instead proceeds  
immediately to step 324 where background processing  
begins. (It should be noted that step 322 differs from step  
304 where the system waits for the user to activate the  
television monitor. With step 322, the system does not wait  
for the user to activate the television monitor but immedi-  
ately triggers either background or non-background  
processing).

Background processing begins at step 324 wherein broad-  
cast signals are received. As with the basic method of FIG.  
8, the system searches for event markers, step 326, and if  
event markers are detected, step 328, the system begins a  
broadcast segment evaluation process to determine whether  
the broadcast segment is a commercial advertisement, step  
330. Details of the broadcast segment evaluation process are  
set forth in FIG. 8–16 and have been described above. Then,  
regardless of whether an event marker has been detected or  
not, execution returns to step 302 to again evaluate whether  
the database is complete. It should be noted that in the  
background processing loop of steps 302–330, there is no  
step of outputting the broadcast signal. Since audio and  
video had previously been disabled, no output signal is  
needed.

If the database remains incomplete and the television  
monitor remains deactivated, the background processing  
mode of steps 302–330 is performed in a loop to build a  
signature database. In this regard, every time a broadcast  
segment evaluation process is triggered at step 328 which  
detects a commercial advertisement, the signature for the  
advertisement is added to the database in the manner  
described above with reference to FIGS. 8–16. The back-  
ground processing loop ends either when the database  
becomes complete (at which time the system waits at step  
304 for user input to activate the television monitor) or when  
the user activates the television monitor at step 322 even  
though the database is not yet complete. In either case,  
non-background processing is then performed.

Thus FIG. 17 sets forth a method for operating the system  
in a background mode to build a signature database even  
while the television set is not otherwise in use and further  
sets forth a technique for determining whether background  
or non-background processing should be performed based  
upon the completion state of the database and upon whether  
the user activates the television monitor. In other  
implementations, rather than detect whether the database is  
full and activate the background processing mode if it is not  
full and the user has not activated the monitor, the system  
merely operates in background mode for some predeter-  
mined period of time after the initial system power up  
(unless the user has activated the monitor). The pre-  
determined period of time may be, for example, two weeks.



As noted, a system employing the above-described techniques may be implemented either as a plug-in module or as an external device. If a plug-in module, the module is interconnected between an output of a tuner portion of the television set and an input to an audio/video display portion of the television set to output selectively muted or otherwise altered audio and video signals. If external, the system may be interconnected to a television set as shown in FIG. 18.

A selective muting unit 400 is connected to audio 402 and video 404 output jacks of a television set 406. The audio and video output jacks are connected internally to a tuner portion (not separately shown) of the television set. Selective muting unit 400 receives the audio and video signals from the tuner via the audio and video output jacks and determines, using the techniques described above, when to initiate and terminate muting. An infrared muting transmitter 408 receives an electrical muting signal from muting unit 400 and outputs an infrared signal to an infrared input 410 of the television set. The infrared muting signal is set to emulate the infrared signal normally received by the television set from an infrared remote control unit (not separately shown) when a user presses a mute button on the remote control. In this manner, the audio is muted during detected commercial advertisements or other unwanted broadcast material as described above. The mute signal is transmitted at the beginning of a detected commercial advertisement and a second un-mute signal is transmitted either at the end of the commercial advertisement or at the end of a group of commercial advertisements.

If the television set is provided with a video mute capability triggered by a video mute infrared signal from a remote control unit, then infrared muting transmitter 408 additionally transmits the video mute signal to thereby provide both video and audio muting. Other television functions responsive to infrared input control may be additionally or alternatively exploited. Also, if the television set is provided with audio and video input jacks along with the audio and video output jacks, muting unit 400 may be configured to output muted audio and video signals into the audio and video input jacks of the television set. In such an embodiment, the television set is set to a mode for outputting signals received via the tuner of the television set through the audio and video output jacks and for displaying signals received through the audio and video input jacks. Hence, selectively muted television signals are displayed in the same manner as if the muting unit were mounted internally within the television set.

Thus far, the invention has been described with respect to exemplary embodiments employing television sets. FIG. 19 illustrates an embodiment employing a PCTV 500 configured to operate either in a television mode or a personal computer (PC) mode. Depending upon the mode, PCTV 500 receives television signals via a cable 502 and an internal tuner (not separately shown) or receives and transmits modulated data signals over a telephone line 504, or other data line such as an ISDN line. Alternately, both television and modulated data input and output may be via a single line such as a cable line. In any case, while in television mode, PCTV 500 displays television signals via a monitor 506 and plays audio signals via speakers 508. While in PC mode, the PCTV displays graphic images generated by computer programs such as web browsers, word processors, spread sheets and the like via monitor 506, plays any corresponding audio via speakers 508 and receives user input via a keyboard 510.

PCTV 500 is provided with hardware or software or both (not separately shown) for selectively muting the audio and

video of television signals while operating in television mode in the same manner as described above. Hence, commercial advertisements or other unwanted broadcast material are selectively muted. When implemented via hardware, a plug-in module as described above is provided. The plug-in module either has its own memory for storing signatures and other information or is configured to employ a disk drive or other storage unit 512 of the PCTV for such purposes. Signatures may be stored temporarily during processing with a RAM (not shown) of the PCTV to expedite processing. If implemented in software, the software may, for example, run on a microprocessor of the PCTV to process digitized portions of the television signal (provided by an analog to digital converter not separately shown) for muting purposes, again using a disk drive or other storage unit 512 for storing signatures and the like. If the PCTV is configured to receive digitized television signals, then no tuner or analog to digital converter may be needed.

When in PC mode, the PCTV does not operate to perform any muting, unless the PC simultaneously displays the television signals within a window of monitor 506. Principles of the invention may be additionally applied to detect and selectively process other types of incoming data signals besides television signals to mute or otherwise alter unwanted portions of the signals, including signals otherwise processed only in PC mode including, for example, advertisement portions of input web pages.

What has been described is a method and apparatus for detecting commercial advertisements by comparing signatures of received broadcast segments with a database of stored signatures corresponding to known commercial advertisements and for muting any segments having a signature matching any of the stored signatures in real-time. For segments having signatures not found in the database, the system nevertheless determines whether the segment is a commercial advertisement and, if so, adds the signature to the database. This latter determination is based upon known characteristics of commercial advertisements. In the exemplary embodiment, the determination is based upon the assumption that commercial advertisements are always preceded and followed by black frame/low audio event markers and are always 15, 30 or 60 seconds in length. This appears to be a fairly universal rule at least with television signals broadcast in the United States. However, if employed in connection with a television broadcast system wherein commercial advertisements are typically of different lengths, the system of the invention may be pre-programmed with those different lengths. In other implementations, other appropriate rules or characteristics of commercial advertisements or other selected segments may be employed either additionally or alternatively for distinguishing the selected segments from other broadcast segments.

In general, almost any set of rules or characteristics of broadcast signals that serve to distinguish commercial advertisements or other selected segments from program segments may be employed to determine whether or not a broadcast segment, for which there is not signature match, is nevertheless a commercial advertisement. The rules are merely programmed or otherwise incorporated within system 108 of FIG. 1 to detect commercial advertisements and an appropriate signature or other distinguishing feature is stored for application against future received broadcast signals. Indeed, suitable rules may be applied to detect almost any desired selected segment within a television broadcast signal and not necessarily just commercial advertisements. Moreover, principles of the invention may be

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applied to signals other than television signal such as to radio broadcast signals.

Moreover, although described with respect to television sets of PCTV's any device or computer configured to receive television or other broadcast signals can be provided with appropriate hardware or software or both for detecting and selectively processing portions of the broadcast signals in the manner described above.

Although described with reference to an exemplary system which operates to mute a television signal during commercial advertisements, almost any other desired action may alternatively be triggered. For example, the system may completely cut off the broadcast video and audio feed and replace the video feed with, for example, a screen presenting an appropriate logo representative of the commercial determination system such as the tradename or trademark of the system, perhaps Sound!OFF™. As another example, the system may change the reception channel upon detection of a commercial advertisements then return to the same channel upon completion of the advertisement or group of advertisements. Such requires a two-tuner system. Also, as described above, the system may merely record the date and time of each commercial advertisement for broadcast verification purposes. As can be appreciated, a wide range of alternative implementations are available consistent with the general principles of the invention.

The preceding description of exemplary embodiments is provided to enable any person skilled in the art to make or use the invention. It should be appreciated that not all components necessary for a complete implementation of a practical system are illustrated or described in detail. Rather, only those components necessary for a thorough understanding of the invention have been illustrated and described. Furthermore, it should be understood that the exemplary embodiments of the invention described herein are merely illustrative of general principles of the invention which can be applied to other applications, to achieve other ends, and to remedy other problems not specified herein. Accordingly, the scope of the invention should not be limited to the exemplary embodiments described herein.

I claim:

1. A method for identifying selected segment of a television signal comprising the steps of:

- detecting a first event marker;
- detecting a signature pattern associated with the first event marker;
- comparing the signature pattern to stored signature patterns;
- if the signature pattern matches any of the stored signature patterns, identifying a pre-determined portion of the television signal following the first event marker as a selected segment;
- if the signature pattern does not match any of the stored signature patterns, analyzing signals following the first event marker to determine whether the signature pattern nevertheless corresponds to a selected segment and, if so, identifying a pre-determined portion of the television signal following the first event marker as a selected segment and storing said signature pattern of the selected segment along with the stored signatures;
- discarding selected stored signatures;
- wherein the method is performed by a television set either while the television signal is displayed for view by the television set or while the television set is otherwise not in use;
- wherein said step of storing said signature pattern of the selected segment along with the stored signatures includes the step of storing an in-use factor with the

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in-use factor being representative of whether the selected segment was encountered at any time while the television set was in use; and

wherein the step of discarding selected stored signatures includes the step of identifying which signatures to discard based in part upon the in-use factor.

2. A method for identifying selected segments of a television signal comprising the steps of:

- detecting a first event marker;
- detecting a signature pattern associated with the first event marker;
- comparing the signature pattern to stored signature patterns;
- if the signature pattern matches any of the stored signature patterns, identifying a pre-determined portion of the television signal following the first event marker as a selected segment;
- if the signature pattern does not match any of the stored signature patterns, analyzing signals following the first event marker to determine whether the signature pattern nevertheless corresponds to a selected segment and, if so, identifying a pre-determined portion of the television signal following the first event marker as a selected segment and storing said signature pattern of the selected segment along with the stored signatures;
- discarding selected stored signatures;
- whenever a selected segment is identified, storing and updating an identification of the television signal when the segment was most recently detected along with the signature of the segment; and
- wherein the step of discarding selected stored signatures includes the step of discarding the signature segments least recently detected.

3. A method of controlling a television receiver comprising:

- (a) displaying a television signal;
- (b) detecting a first segment of the television signal;
- (c) capturing a signature pattern associated with the first segment of the television signal;
- (d) comparing the captured signature pattern to stored signature patterns;
- (e) if the captured signature pattern matches one of the stored signature patterns, controlling the television receiver to alter the displayed television signal;
- (f) if the captured signature pattern does not match any of the stored signature patterns, storing the captured signature pattern in a temporary storage location;
- (g) adding the captured signature pattern to the stored signature patterns if a second segment of the television signal is detected within a predetermined window of time following detection of the first segment.

4. The method of claim 3 wherein controlling the television receiver to alter the displayed television signal comprising muting an audio portion of the television signal.

5. The method of claim 4 wherein the audio portion of the television signal is muted for a length of time stored in association with said one of the stored signature patterns.

6. The method of claim 5 further comprising generating an audible alert when the length of time during which the audio portion of the television signal is muted expires.

7. The method of claim 3 wherein controlling the television receiver to alter the displayed television signal comprises muting a video portion of the television signal.

8. The method of claim 7 wherein the video portion of the television signal is muted for a length of time stored in association with said one of the stored signature patterns.

\* \* \* \* \*

ELECTRONIC PROGRAM GUIDE  
WITH ADVANCE NOTIFICATION

Cross Reference to Related Application

This application claims the benefit of  
5 United States Provisional Application No. 60/097,504,  
filed August 21, 1998.

Background of the Invention

This invention relates to program guide  
systems, and more particularly, to techniques for  
10 notifying a user of television programs.

Cable, satellite, and broadcast television  
systems provide viewers with a large number of  
television channels. Viewers have traditionally  
consulted printed television program listings to  
15 determine which programs were scheduled to be broadcast  
on a particular day and at a particular time.

Recent technological advances have allowed  
more convenient and advanced program guide services to  
be developed. For example, passive television-based  
20 program guides have been developed that allow  
television viewers to view television program listings  
directly on their television sets. In addition,

interactive television program guide services have been developed that allow a service provider to deliver television program listings data to a user's local set-top box. An interactive television program guide application in the set-top box allows the user to display television program listings on the user's television set. In known interactive program guide systems, the program listings data made available to a user are limited to a predetermined time frame of program listings.

Users may be interested in programs other than the programs in the available time frame of program listings. Such so-called non-frame television programs are those television programs which are outside the current display time frame. In contrast, in-frame television programs are those television programs which are inside the current display time frame. The current display frame for program guides is typically about two weeks or less, which is limited by the size of the program guide database that is maintained by the program guide. The frame can also be limited by the bandwidth for the distribution of the data and limited by the ability to collect accurate data (e.g., collected listings which are farther out in time can be less accurate). As an example of the category of non-frame television programs, consider movies presently showing in movie theaters but soon to be released on pay-per-view cable. Because cable customers are not provided with information that lets them know that the movie they are planing to see at the local movie theater will be available shortly on cable, cable companies stand to lose revenue to movie theaters. Similar problems exist for televised sporting events and the like.

Thus, users are still faced with the problem of tracking television programs that they desire to watch but which have not yet been scheduled (i.e., non-frame television programs).

- 5           It is therefore an object of the present invention to provide a way to notify users of upcoming television programs.

#### Summary of the Invention

- 10           This and other objects of the invention are accomplished in accordance with the principles of the present invention by providing program guide notification methods and systems.

- 15           Users may be interested in programs which are not in a current program listings time frame of a program guide. For such programs, the program guide can provide a notification option. The notification option can provide the user with an opportunity to request that a notification to be received when a program of interest is determined to be in the current  
20   time frame. Notifications can be message notifications, reminder notifications, e-mail notifications, etc. The user can be provided with the opportunity to setup the parameters for notifications. The program guide can provide the user with the  
25   opportunity to view a list of notifications. Notifications can be set by selecting an advertisement for an upcoming program that is not presently in the current time frame, by entering a title of a program, by selecting a program from a coming soon display  
30   screen, etc. A notification can include information on the program for which the notification is being provided and can include user-selectable options. The program guide can monitor the user's notification

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requests to collect information that can be used in marketing, scheduling programs, advertising, etc.

According to one aspect of this invention, a method of providing interactive options for non-frame television programs on a display screen of a system (e.g., a television program guide system) is provided. The method includes: (1) presenting on the screen (e.g., a program guide screen) at least one option that corresponds to a non-frame television program,  
10 (2) allowing the user to select a first option, and  
(3) providing the user a service associated with the first option.

In another embodiment, an interactive method of notifying a user of non-frame television programs that are now in-frame for use with a system (e.g., a television program guide system) is provided. This method includes: (1) receiving non-frame data that corresponds to at least one non-frame television program, and (2) when the non-frame program is in-  
20 frame, notifying a user that the program will be broadcast in the current time-frame by providing the user with at least one interactive option that corresponds to the data.

In yet another embodiment according to this  
25 invention, a method for providing notifications of non-frame television programs to a user using a system (e.g., a television program guide system) is provided. The method includes: (1) allowing a user to specify a non-frame television program outside of the current  
30 display time frame, and (2) notifying the broadcast time to the user when the non-frame television program is now in the current time frame. In this embodiment, notification can be either non-interactive or interactive. In one non-interactive example, the

method can involve sending a notification (or providing a notification order screen) with information regarding one or more selected non-frame television programs that are to be aired without a user-selectable option. In  
5 contrast, an interactive example might include a user-selectable option.

A coming soon program display screen can be provided according to this invention. Included on the coming soon program display screen are non-frame  
10 television programs which are outside the current display time frame.

If a user selects a program or a pay-per-view event that has not yet been included in the program listings of the current time frame, additional  
15 information related to the program or event can be displayed in a program information box. In addition to viewing this additional information on the program selected, the user can order a notification to notify the user when the selected program will be broadcast.  
20 Options can also be provided that allow the user to determine when notifications will be generated.

If desired, a notification can be set by directly entering the title of a television program for which notifications are desired.

25 As mentioned above, the user can also view a list of all currently requested notifications. If desired, information, such as the program name, type of notification, and the date and time the request was submitted can be displayed on the list for each  
30 notification. Entries can be added to the current notification list as soon as the user submits a new request. In addition, the user can cancel notification entries.

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In yet a further aspect of the invention, electronic mail notifications can be set and generated based on other preferences which the user can specify.

Further features of the invention (including  
5 systems for implementing these methods), its nature and various advantages will be more apparent from the accompanying drawings and the following detailed descriptions of the preferred embodiments.

#### Brief Description of the Drawings

10 FIG. 1 is a diagram of an illustrative television program guide system in accordance with the present invention.

FIG. 2 is a diagram of an illustrative main  
15 program guide menu display screen in accordance with the present invention.

FIG. 3 is a diagram of an illustrative current listings display screen from which the program listings in the current time frame can be available in accordance with the present invention.

20 FIG. 4 is a diagram of an illustrative notifications display screen which can provide an illustrative notifications list in accordance with the present invention.

FIG. 5 is a diagram of an illustrative  
25 messages display screen which can include a list of messages in accordance with the present invention.

FIG. 6 is a diagram of an illustrative message display screen in accordance with the present invention.

30 FIG. 7 is a diagram of an illustrative notification display screen in accordance with the present invention.

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FIG. 8 is a diagram of an illustrative reminder display screen in accordance with the present invention.

FIG. 9 is a diagram of an illustrative set  
5 message display screen in accordance with the present invention.

FIG. 10 is a diagram of an illustrative e-mail display screen in accordance with the present invention.

10 FIG. 11 is a diagram of an illustrative new notification display screen in accordance with the present invention.

FIG. 12 is a diagram of an illustrative reminder list display screen in accordance with the  
15 present invention.

FIG. 13 is a diagram of an illustrative coming soon display screen in accordance with the present invention.

FIG. 14 is a diagram of an illustrative  
20 coming soon display screen in accordance with the present invention.

FIG. 15 is a diagram of an illustrative setup display screen in accordance with the present invention.

25 FIG. 16 is a diagram of an illustrative notification setup display screen in accordance with the present invention.

FIG. 17 is a flow chart of illustrative steps involved in providing a notification feature in  
30 accordance with the present invention.

FIG. 18A is a diagram of an illustrative program guide screen containing television program guide listings in accordance with the present invention.

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FIG. 18B is a diagram of an illustrative coming soon program screen in accordance with the present invention.

FIG. 19 is a diagram of an illustrative notification screen that allows a user to enter information for ordering notifications in accordance with the present invention.

FIG. 20 is a diagram of an illustrative notification screen that allows the user to enter more specific information for ordering notifications in accordance with the present invention.

FIG. 21 is a diagram of an illustrative notification in accordance with the present invention.

FIG. 22 is a diagram of an illustrative notification screen listing all current notification orders in accordance with the present invention.

FIG. 23 is a diagram of an illustrative notification screen that allows a user to enter a program title and to select among various options when ordering a notification in accordance with the present invention.

#### Detailed Description of the Preferred Embodiments

An illustrative interactive television program guide system 10 in accordance with the present invention is shown in FIG. 1. Main facility 12 can contain a back office processor 14 for organizing data, such as television program guide listings data, as will be described in greater detail below. Main facility 12 can also contain a program guide database 16 for storing program guide information, pay-per-view ordering information, television program promotional information, etc. Some of the information stored in database 16 can be from an external data source 18.

Back office processor 14 is used to process the information stored in database 16.

Information from database 16 can be transmitted to multiple television distribution facilities, such as television distribution facility 20 via communications links, such as communications link 21. Only one television distribution facility is shown in FIG. 1 to avoid over-complicating the drawings. Each Link 21 can be a satellite link, a telephone network link, a cable or fiber optic link, a microwave link, a combination of such links, or any other suitable communications path. If it is desired to transmit video signals over link 21 in addition to data signals, a relatively high bandwidth link, such as a satellite link is generally preferable to a relatively low bandwidth link, such as a telephone line.

Television distribution facility 20 is a facility for distributing television signals to users. Television distribution facility 20 can be, for example, a cable system headend, a broadcast distribution facility, a satellite television distribution facility, or any other suitable distribution facility.

The program guide information transmitted by main facility 12 to television distribution facility 20 includes television program listings data for current and future television programs. The television program listings data for each program preferably includes numerous program characteristics, e.g., the title of the program, the channel for the program, a scheduled broadcast time (start time) and an ending time (or duration). Other typical program characteristics include ratings, critics ratings, descriptions,

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categories (sports, movies, comedy, children, etc.), actors, etc. Transmitted program information can also include advertising information and pay program data, such as pricing information for individual programs and  
5 subscription channels, time windows for ordering programs and channels, telephone numbers for placing orders that cannot be impulse ordered, etc.

Television distribution facility 20 distributes television programming and program guide  
10 information to the user television equipment 26 or the user personal computer (PC) equipment 28 of multiple users via communications paths 30 and 32, respectively. PC equipment 28 is based on a central processing unit (CPU) 44 and can have a monitor 46 and keyboard 48.  
15 User television equipment 26 is based on a set-top box 34 and can have optional videocassette recorder 38, television 40, and remote control 42.

Various techniques can be used to distribute television programming and program guide information.  
20 For example, television programming can be distributed over analog television channels and program guide data can be distributed over an out-of-band channel on paths 30. Data distribution can also involve using one or more digital channels on paths 30 and 32. Such  
25 digital channels can also be used for distributing television programming and other information. Multiple television and audio channels (analog, digital, or both analog and digital) can be provided to set-top boxes 34 and PC equipment 28 via communications paths 30 and 32.  
30 In user television equipment 26, television programs can be tuned to by user's set-top box 34 and can be displayed by television 40. In user PC equipment 28, a video board or other such component can be used to tune to a television program, and the television program can

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be displayed on monitor 46. Program listings and other information can be distributed via communications paths 32 to PC equipment 28, which can have a cable modem or other such communications device for receiving or transmitting data. In addition, program listings and other data can be distributed by one or more distribution facilities that are similar to but separate from television distribution facility 20 using communications paths that are separate from communications paths 30 and 32. If desired, data from the main facility 12 can be distributed to PC equipment 28 over the Internet or other suitable communications path that does not involve the use of television distribution facility 20. In some configurations, program guide functions are provided in the form of an on-line program guide by using PC equipment 28 to access a web server, such as web server 29 over the Internet 31 or other such data network.

The program guide system can use a client-server architecture whether or not the system involves use of the Internet. In a client-server arrangement, the program guide is partially implemented on a server and partially implemented on a client. The server can be a server, such as server 22 located at, for example, television distribution facility 20. Processors in the user equipment, such as set-top box 34 or CPU 44, can act as the client processors. Program guide data that are distributed to a client-server program guide at television distribution facility 20 can be stored in a database 24 at television distribution facility 20 that is maintained by server 22. For clarity, the present invention is described primarily in the context of an interactive television program guide that is

implemented on user equipment using a set-top box 34 or CPU 44 that receives data from television distribution facility 20, rather than in the context of program guides that are implemented using an on-line program guide configuration, are implemented partially on a server and partially on user equipment, or are implemented using any other such arrangements.

Certain functions, such as pay program purchasing can require set-top boxes 34 to transmit data to television distribution facility 20 over communications paths 30. If desired, such data can be transmitted over telephone lines or other separate communications paths. If functions, such as these are provided using facilities separate from television distribution facility 20, some of the communications involving set-top boxes 34 can be made directly with the separate facilities.

User television equipment 26 has a receiver, which is typically a set-top box, such as set-top box 34, but which can be other suitable television equipment into which circuitry similar to set-top box circuitry has been integrated. For example, user television equipment 26 can be based on an advanced television receiver, such as a high definition television ("HDTV") receiver. Program guide data can be distributed to set-top boxes 34 periodically or continuously and stored in database 36. In a client-server architecture, this database need not be maintained on the set-top box and may be distributed over a number of different locations. For example, the program guide can maintain a database, such as database 24, using a server, such as server 22 located at television distribution facility 20 or at some other appropriate location or locations. Television

distribution facility 20 can poll set-top boxes 34 periodically for certain information (e.g., pay program account information or information regarding programs that have been purchased and viewed using locally-generated authorization techniques).

Main facility 12 preferably contains a processor to handle information distribution tasks. Each set-top box 34 preferably contains a processor to handle tasks associated with implementing a program guide application on the set-top box 34. User PC equipment contains CPU 44 to handle tasks associated with implementing a program guide application. Television distribution facility 20 can contain a processor for tasks associated with monitoring a user's interactions with the interactive program guides implemented on user PC equipment 28 and user television equipment 26 and for handling tasks associated with the distribution of program guide data and other information to user PC equipment and user television equipment 26. Moreover, the processor of television distribution facility 20 can be used to support the server functions of a client-server program guide.

In user television equipment 26, videocassette recorders 38 or other suitable recording devices allow selected television programs to be recorded. Each videocassette recorder 38 is connected to a respective television 40. To record a program, set-top box 34 tunes to a particular channel and sends control signals to videocassette recorder 38 (e.g., using an infrared transmitter) that direct videocassette recorder 38 to start and stop recording at the appropriate times.

During use of the interactive television program guide implemented on set-top box 34, television

program listings and other information can be displayed on television 40. Such program guide displays can be presented as an overlay on top of a television program to which the user has tuned with set-top box 34 or can be presented in place of such a program. Each set-top box 34, videocassette recorder 38, and television 40 can be controlled by one or more remote controls 42 or any other suitable user input interface, such as a wireless keyboard, mouse, trackball, dedicated set of buttons, touch screen display remote, etc. Remote controls, such as remote control 42, have various buttons that can be pressed by the user such as arrow keys (for directing on-screen movement of a highlight region, scrolling functions, etc.), an OK, select, enter, or other such selection key for making a selection (hereinafter referred to as an OK key), channel number keys (for selecting a television channel), a favorites key (to invoke functions related to user preferences), a delete key (to delete menu items or to express a disinterest in certain user preferences), etc.

PC equipment, such as PC equipment 28, is based on a CPU 44 that maintains a database 45. A program guide implemented on PC equipment 28 can be used to access and display program guide information on monitor 46. User selections and inputs can be made by a keyboard 48, mouse, trackball, or other PC input devices. It is understood that the following discussion, although directed to user television equipment and set-top boxes, is applicable to program guides used in connection with PC equipment.

Notification can be presented in a number of ways, such as "on-screen," "on-line," etc. As used herein, "on-line" notification includes notifications



"On-screen" notification includes notifications transmitted to user-television equipment. "On-screen" and "on-line" notification methods are not mutually

A program guide display screen can include a notifications option. For example, as shown in FIG. 2, illustrative main program guide menu display screen 60 can include notifications option 62 and six other options (current listings option 64, movies option 66, Pay-per-view option 68, messages option 70, coming soon option 72, and setup option 74). In addition, display screen 60 can include brand logo 82, system operator logo 84, current-time display portion 86, new message indicator 88, and advertisements 76, 78, and 80.

A program guide user can select an option by, for example, navigating a highlight region on a selectable option and pressing a data entry key, such as an OK key of a remote control.

A notification option can be available for  
30 programs that are not in the current program listings  
time frame of the program guide. Such out-of-time-  
frame programs (i.e., non-frame programs) can include  
programs that are not in the current time frame of the  
program guide, but are in a schedule stored at a main

The program guide system can store a list of programs which are not in the current time frame but have been scheduled or which are upcoming programs that have not yet been scheduled. The list can be stored at a main facility, at a server at a television distribution facility, or at user television equipment. When a user is provided with the opportunity to enter a title for a program (see below), the list can be searched for programs matching the entered title. The search can occur at the location where the list is stored. As programs move into the current program guide time frame, the comparison between the database programs in the current program guide time frame and programs in the user's notifications list can take place at any of those locations (e.g., main facility, server, or user television equipment).

When a user selects current listings option 64, the program guide can display a current listings display screen, such as illustrative current listings display screen 96 of FIG. 3. From the current

listings display screen 96, the program guide can provide the user with the opportunity to view a time versus channel listing of programs. The display 96 can provide the user with the opportunity to view and act  
5 on the program listings for the current time frame (e.g., one week, two weeks, etc.). The program guide can retrieve the program listings for the current time frame from a local database (e.g., database 24 or 36 of FIG. 1).

10 When a user selects movies option 66 or pay-per-view option 68, the program guide can display a listings display screens for the current time window of movies or pay-per-view programs. Each listings display screens can have a format which is similar to  
15 illustrative current listings display screen 96. It is to be understood that the format for display screen 96 is illustrative and other formats for listings display screens can be employed.

When a user selects a notification option,  
20 such as notifications option 62 of FIG. 2, the program guide can display illustrative notifications display screen 90 of FIG. 4. Display screen 90 can include list 92 of notifications that the user has previously set (e.g., notifications for the Blair Witch Project,  
25 Now and Again, and the Mummy). The program guide can provide the user with the opportunity to select any one of the displayed notifications in order to delete or modify the selected notification. An add new notification option, such as option 94, can provide the  
30 user with the opportunity to add a new notification to the list. The add new notification option can be contained in list 92 or can be in another suitable position on display screen 90.

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When a user selects a messages option, such as messages option 70 of FIG. 2, the program guide can display a messages display screen, such as illustrative messages display screen 98 of FIG. 5. Display screen 98 can include a list of messages 100. The list 100 can include all messages that have been sent to this user's household. List 100 can include notification messages (e.g., the first two messages in list 100). Other types of messages can be included in list 100, such as a message for informing the user of a cable outage. A user can select a message from list 100 by navigating a highlight region on an item in the list and pressing a data entry key, such as an OK key of a remote control.

When a user selects a message from list 100, the program guide can display a message display screen, such as message display screen 102 of FIG. 6. When the selected message is a message other than a notification message, the program guide can display the message title, message text, and the option to keep or delete the selected message. When the selected message is a notification message, the program guide can display the program title as the message title and the program description as the message text. For a notification message, the program guide can display the scheduled time and channel for the program. The program guide can also display options which are related to the program. For example, the program guide can display order option 104, keep option 106, delete option 108, air times option 110, and reminder option 112. When the notification message is for a pay-per-view program, order option 104 can be displayed to provide the user with the opportunity to impulse order the program. When reminder option 112 is selected, the program guide

can provide the user with the opportunity to set a reminder for the program. When air times option 110 is selected, the program guide can provide the user with the opportunity to view a list of broadcast times.

5 When keep option 106 is selected, the program guide can keep the message for future reference by the user, and when delete option 104 is selected, the program guide can delete the message. The program guide can determine which options can be displayed based on the  
10 program for which the notification message was received. For example, when the selected program is a pay-per-view program, order option 108 can be displayed. Air times option 110 can be displayed when there is more than one show time for the program.

15 A message can have been sent to users to announce to users that a program is coming soon (e.g., an e-mail advertisement for a future program which is not in the current time frame). For such messages, the program guide can display notify option 114. The time  
20 and channel of the program can not be displayed in the message since the program is not yet listed in the current time frame of the program guide. When the notify option 114 is selected for a program that is not currently listed, the program guide can provide the  
25 user with the opportunity to set a notification for that program.

For example, as shown in FIG. 7, when the user selects a notify option for a program that is not within the current time-frame of the program guide, the  
30 program guide can display a notification display screen, such as illustrative notification display screen 116 of FIG. 7. A notification display screen, such as illustrative notification display screen 116, can be displayed under certain other circumstances.

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For example, when a user selects an advertisement for a program that is not listed in the current time frame, the program guide can display notification display screen 116. Also, when a user selects a program from a coming soon display screen (discussed below), the program guide can display notification display screen 116. Moreover, when a user selects a program from a notifications display screen (e.g., notifications display screen 90 of FIG. 4), the program guide can display notification display screen 116 to provide the user with the opportunity to modify or delete that notification.

Notification display screen 116 can include the title of the program and a description of the program. When a user has set a notification by entering a title of a program (discussed below) and a description is not yet available for that program, the program guide can simply display a description that is blank. Notification display screen 116 can include user-selectable options. For example, notification display screen 116 can include delete option 118, remind option 120, message option 122, and e-mail option 124.

When delete option 118 is selected, the program guide can delete the notification. The types of notification desired can be specified with user-selectable options, such as remind option 120, message option 122, and e-mail option 124. The program guide can display a status indicator (e.g., a checkmark) in remind, message, and e-mail options 120, 122, and 124 to indicate that the user has already selected a notification of this type for the program.

When a user selects a remind option, such as remind option 120 of FIG. 7, the program guide can

display a reminder display screen, such as reminder display screen 126 of FIG. 8. Display screen 126 can provide the user with the opportunity to confirm the setting of a reminder for the upcoming program. When a  
5 remind option is selected for a program that a reminder notification has already been set, the program guide can provide the user with an opportunity to delete the reminder.

When a user selects a message option, such as  
10 message option 122 of FIG. 7, the program guide can display a set message display screen, such as set message display screen 128 of FIG. 9. Display screen 128 can provide the user with the opportunity to confirm that a message should be sent to the user's  
15 household when the program is scheduled (e.g., when the upcoming program is now determined to be scheduled to be displayed during the current time frame). When the message option (e.g., message option 122 of FIG. 7) is selected for a program for which the message option has  
20 already been set, the program guide can query the user to determine whether the message should be canceled.

When a user selects an e-mail option, such as e-mail option 124 of FIG. 7, the program guide can display an e-mail display screen, such as e-mail  
25 display screen 130 of FIG. 10. E-mail display screen 130 can provide the user with the opportunity to select to have an e-mail notification sent to the user's e-mail address. E-mail display screen 130 can provide the user with the opportunity to enter an email  
30 address. Depending on the program guide system arrangement, an e-mail address can be entered with a remote control, a keyboard, a display remote, etc. If desired, a setup display screen, discussed below, can provide the user with the opportunity to enter an e-

mail address which would then be applied to all e-mail notifications. When an e-mail option (e.g., e-mail option 124 of FIG. 7) is selected and the user had already set an e-mail option earlier to receive an e-mail notification, the program guide can provide the user with the opportunity to delete the e-mail notification.

As discussed above, when a user selects an advertisement for a non-frame program, the program guide can display a notification display screen, such as notification display screen 116 of FIG. 7. For example, a user can select interactive advertisements 76, 78, and 80 of FIG. 2, which are for programs that are not yet available in the current time frame of the program guide. As shown in FIG. 2, advertisement 76 can be for the Blair Witch Project, which is a future program that is coming to pay per view. Advertisement 78, an advertisement for Now and Again, can be for a new program to air in the fall television season which is now being advertised in the summer season. Advertisement 80 can be an advertisement for the upcoming new season of the E.R. television program which can commence in the next time frame. When a user selects any one of the three advertisements 76, 78, and 80, the program guide can display a notification display screen, such as notification display screen 116 of FIG. 7.

When a user selects an add-new-notification option, such as add-new-notification option 94 of FIG. 4, the program guide can display a new notification display screen, such as new notification display screen 132 of FIG. 11. Display screen 132 can provide the user with the opportunity to enter the title of a program for which the user desires to



receive a notification. The title can be entered with a remote control, keyboard, a display remote, or another suitable data entry interface. When a title is entered, the title can be added to a notification list, such as notification list 92 of FIG. 4. The title can be added without a description. The program guide can determine whether the title for the program is in the current time frame, which can be stored in a local database of the program guide or at a remote server.

10 When there is a match, the program guide can retrieve the matching information (e.g., program description). Display screen 132 can include options for providing the user with the opportunity to specify the types of notification desired (e.g., remind, message, e-mail, etc.).

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After a user has set reminders for upcoming programs, the program guide can display a reminder list display screen, such as reminder list display screen 134 of FIG. 12. The program guide can automatically display reminder list display screen 134 shortly before the start of the upcoming program. Display screen 134 can include an overlay containing a list of reminders which have been set by the user. The overlay can be displayed on top of the video for the program that the user is currently watching. Display screen 134 can include a hide reminder option 136. When the user selects hide reminder option 136, the program guide can remove the overlay and return the user to viewing the current program. When the user selects a specific program in the list, the program guide can tune immediately to the channel showing that program. The program guide can provide the user with the opportunity to view the reminder list at any time until the listed programs end. The opportunity to

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selectively view the reminder list at any time can, for example, be provided by providing a predetermined key on a remote control. The list can include reminders other than notification reminders (e.g., reminders set  
5 for other features of the program guide), which can have been configured with a different configuration setup than for notification reminders.

Advance notification can be provided for programs that are coming soon. For example, the  
10 program guide can include a coming soon option, such as coming soon option 72 of FIG. 2. When coming soon option 72 is selected, the program guide can immediately display a list of upcoming programs (e.g., display screen 138 of FIG. 14) or can first display a  
15 selectable list of types of upcoming programs, such as coming soon display screen 140 of FIG. 13. Display screen 140 can contain a list of different types of upcoming programs in which the user can be interested. For example, as shown FIG. 13, the list can contain  
20 options for upcoming pay-per-view movies, upcoming special events, returning series, announced new series, upcoming programs on a specific channel, etc.

When a user selects an option from display screen 140, such as pay-per-view movies option 142, the  
25 program guide can display a coming soon display screen, such as coming soon display screen 138 of FIG. 14. Display screen 138 can contain a list of programs that match the selected program type (e.g., pay-per-view movies) and that are not yet within the current time  
30 frame of the program guide. The list can be sorted alphabetically or by any other appropriate criteria. The list can include upcoming programs that have been scheduled to air outside the current time frame of the program guide. If desired, the list can include

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upcoming programs that have not yet been scheduled. For example, the list can include upcoming programs that have been announced but not yet scheduled. The list can include an indicator for a program, such as  
5 indicator 144. Indicator 144 can indicate that the user has already set a notification for that program. When the user selects a program from the list, the program guide can display a notification display screen for that program, such as notification display  
10 screen 116 of FIG. 6. Notification display screen 116 can provide the user with the opportunity to set, delete, or modify a notification for the program.

The user can be provided with the opportunity to setup the configuration of notifications. For  
15 example, when a user selects a setup option, such as setup option 74 of FIG. 2, the program guide can display a setup display screen, such as setup display screen 146 of FIG. 15. Setup display screen 146 can include notifications setup option 148. When a user  
20 selects notifications setup option 148, the program guide can display a notification setup display screen, such as notification setup display screen 150 of FIG. 16. Display screen 150 can include reminder notice setup option 152, message notice setup  
25 option 154, and e-mail notice setup option 154. If desired, setup display screen 146 can include an option for specifying whether reminders will be displayed on a television screen, a display remote, or both.

Reminder notice setup option 152 can provide  
30 the user with the opportunity to specify how far in advance of a start time of an upcoming program a reminder notification should be displayed. Values for how far in advance a reminder notice can be displayed can be set for example to be in the range of one to

5 not in a current time frame of the program guide, a  
reminder notification for that program can be set.  
Later, when the program guide determines that the  
program is now in the current time frame, the program  
guide can activate the reminder notification at an  
10 appropriate time before the start time of that program.

The user can set the notice to receive a message notification for a program a few hours before the program or as far ahead of the program as the available program guide data permits (e.g., the length of the current time frame). If desired, the program guide can use a default value for the message notice time (e.g., one day) or can generate the notification message as soon as the program is added to the local program listings database of the program guide.

Notification setup display screen 150 can  
30 provide a user with the opportunity to specify an e-  
mail notification address. If desired, the program  
guide can allow the user to specify an individual e-  
mail address for each notification. If desired, the  
program guide can have an e-mail address for the

household as part of an e-mail feature, and can use that address, rather than requiring the user to enter the address again.

If desired, the program guide can provide the user with the opportunity to setup the configuration notifications for each individual program. For example, the program guide can display in a notification display screen (e.g., notification display screen 116 of FIG. 7) a notification setup option, such as notification setup option 119 of FIG. 7. When a user selects notification setup option 119, the program guide can display a notification setup display screen, such as notification setup display screen 150 of FIG. 16, to setup the notifications for that program. An individual program notification setup can be available in addition to a general setup for notifications. If desired, a setup for notifications can include a general option that specifies whether reminders, messages, or e-mails should be generated whenever a program with a notification comes into the current time-frame of the program guide.

When the user sets a notification for a program, the program notification can be stored, preferably in non-volatile memory, at the user television equipment (e.g., user television equipment 44 of FIG. 1). If desired, when the program guide system is in a client-server arrangement, the program notification can be stored at a server (e.g., server 22 at television distribution facility 20 of FIG. 1).

When new schedule items are received by the program guide (either at server 22 or user television equipment 26), the incoming schedule items can be compared with the notification list (e.g., the programs

listed in notification list 92 of FIG. 4). When there is a match, the program guide can generate a notification for that program (e.g., reminder notification, e-mail notification, message notification etc.). The type of notification desired can have been set earlier from a display screen, such as notification display screen 116 of FIG. 7. The advance notice time for the notification can have been set earlier from a display screen, such as notification setup display screen 150 of FIG. 16.

For example, when a reminder notification has been set for a program that is determined to be in the current time frame, the program guide can schedule a reminder overlay for a specified number of minutes prior to the start of the program. When a message or e-mail notification has been set, the program guide can immediately generate a notification or can schedule a task to generate a message or e-mail notification an appropriate number of days or hours prior to the scheduled start of the program.

Illustrative steps involved in providing a notification feature are shown in FIG. 17. At step 152, the program guide can provide the user with the opportunity to select or specify an upcoming program which is not yet in the current program listings time frame of the program guide.

If desired, step 152 can include informing the user of an upcoming program (step 154). For example, the program guide can display a coming soon display screen (e.g., coming soon display screen 140 of FIG. 13). The program guide can display a different coming soon display screens based on category, type, actor, genre, etc. (e.g., coming soon display screen 138 of FIG. 14). The program guide can send a

5 the current program listings time frame.

10 screen (e.g., message display screen 102 of FIG. 6), a  
new notification display screen (e.g., by entering a  
program title or partial title from new notification  
display screen 132 of FIG. 11), a coming soon display  
screen for a category, such as genre, actor, rating,  
15 etc. (e.g., coming soon display screen 138 of FIG. 14  
for upcoming pay-per-view programs), etc.

At step 156, the program guide can display information and user-selectable options that are related to the selected program. For example, the program guide can display a description, title, graphics, etc. about the selected program. As for user-selectable options, the program guide can provide the user with the opportunity to select an option to set a message notification (e.g., message option 122 of FIG. 7), to select an option to set an e-mail notification (e.g., e-mail option 124 of FIG. 7), to select an option to track a program (e.g., the program will be added to the notification list but no notification will be generated), to select an option to set a reminder notification (e.g., remind option 120 of FIG. 7), to select an option to purchase the selected program (e.g., order option 108 of FIG. 6), to select an option to have the program guide automatically tune to the channel carrying the select program at or about

the time of airing, to select an option to have the program guide automatically cause the program to be recorded when the program airs, etc.

When the user selects an option, the program  
5 guide can provide the user with the opportunity to  
setup features related to the option. For example, the  
program guide can provide the user with the opportunity  
to select how far in advance a message, e-mail, or  
reminder notification should be sent. For purchase,  
10 tune, and record options, the program guide can provide  
the user with the opportunity to specify parameters,  
such as day of the week, time of day, etc. For  
example, the user can be allowed to select to a time  
range in which the program guide is authorized to  
15 purchase, tune, or record a program.

At step 158, when the user has selected an  
option, the program guide can collect information on  
which programs and which options have been selected  
(step 158a). The information can be collected at a  
20 central location (e.g., television distribution  
facility 20 of FIG. 1). The information can be used to  
influence the scheduling of programming, the marketing  
of programming, the distribution of programming, and  
the targeting of advertisements, and to generate e-mail  
25 notifications.

Step 158 can include providing the user with  
the opportunity to view or modify notifications set for  
programs (step 158b). For example, the program guide  
can provide the user with the opportunity at any time  
30 to view a notifications list (e.g., notifications  
list 92 of FIG. 4). An item in the notification list  
can be automatically removed from the list after a  
selected notification has been provided or can be  
removed a predetermined number of days after the



program has been received within the local program  
guide database (e.g., the current program listing time  
frame). If desired, an item in the list can be removed  
after the program has been viewed or after the program  
5 is no longer available in the current time frame. The  
list can include an indication of which programs are  
presently in the current time frame of the program  
guide. From the notification list, the user can be  
provided with the opportunity to access a notification  
10 display screen (e.g., notification display screen 116  
of FIG. 7) in order to view, modify, or delete a  
notification that has been set for a program.

Step 158 can include providing a notification  
for a selected program which is now in the current  
15 program listings time frame (step 158c). When the user  
has set a notification message or reminder, the program  
guide can display a reminder notification or send a  
message notification when the program is determined to  
be in the current time frame of the program guide. If  
20 desired, a message notification can be sent or a  
reminder notification can be displayed at a  
predetermined notice time prior to the airing of the  
program. When the user has set an e-mail notification,  
an e-mail notification can be sent when it is  
25 determined that the program is in the current time  
frame of the program guide. If desired, the e-mail  
notification can be sent at a predetermined time prior  
to the airing of the program. The e-mail notification  
can be sent from a central facility (e.g., television  
30 distribution facility 20 of FIG. 1) or the program  
guide can generate the e-mail notification locally at  
user television equipment (e.g., user television  
equipment 26 of FIG. 1). After a notification has been  
provided, the status of a notification in the

notification list can be modified (e.g., the program can be removed from the list when all the notifications which had been set by user have been performed). At step 158c, the program guide can provide notification  
5 options, such as to tune or record the selected program.

In the following discussion below with reference to FIG.'s 18 through 32, the present invention is discussed sometimes primarily in the  
10 context of a program guide system with a mouse, a keyboard, or both as a user interface device (e.g., an on-line PC based program guide system). It is to be understood that the present invention is not limited to such an arrangement.

FIG. 18A shows an illustrative program guide display screen that can be provided in a PC based program guide system. Display screen 218 contains program listings 220 that can be organized in channel order from top to bottom and by broadcast time from  
15 left to right. Cursors 222 and 224 can be used to navigate to earlier or later time periods, respectively. Browser cursors 226 and 228 allow a user to scroll through program listings 220. The user can also navigate through program listings 220 with time  
20 navigation buttons 230 to view program listings for different times in the day. Calendar buttons 232 can be used to view program listings for different days of a month. The user can choose between various available view options by selecting a desired time, channel,  
25 category, or search button from among view buttons 234.

FIG. 18B shows an illustrative coming soon program display screen 310 that can be provided as an option from the display screen 218 of FIG. 18A, or can be accessed independently. The user can activate the

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coming soon program display screen from display screen 218 of FIG. 18A by means of box 236. Included on the coming soon program screen are non-frame television programs which are outside the current display time frame. For example, in FIG. 18B, there are several movies, including Titanic, The General, and Saving Private Ryan, all of which (at least for the purposes of this description) have not yet been released on cable television.

10 Program guide screen 310 can also include one or more markers 312 that indicate that information regarding other programs is now available to the user (e.g., a listing for Rushmore is in the current time frame). When data regarding a non-frame television  
15 program is added, the non-frame television program by definition becomes an in-frame television program. The marker can be, for example, an icon, a color, a display order, and any combination thereof. More than one type of marker can be used on a single screen to indicate  
20 more than one type of information regarding the television program. For example, a star placed next to the listing can indicate that the program will be broadcast on a pay-per-view channel and an underline can indicate optional on-line links to more information  
25 and promotional offers.

If a program is selected from coming soon display screen 310 of FIG. 18B, the user can be presented with a notification order display screen, such as notification order display screen 410 of  
30 FIG. 19. Notification order display screen 410 can contain user-selectable options for ordering a notification. Notifications can notify the user when a particular television program is to be broadcast. As defined herein, the term "broadcast" refers to the

process of airing scheduled television programs by traditional television broadcast techniques, cable systems, or satellite systems. It will be appreciated that the methods and apparatus described herein can  
5 also be used in connection with non-frame videos-on-demand.

FIG. 19 shows fields 414 and 418 in notification order display screen 410, which allow the user to enter a name and electronic mail address,  
10 respectively, of the person receiving the notification. If desired, the user's name and electronic mail address can be automatically entered in fields 414 and 418 based on information previously provided to the system (e.g., information provided when the user registered  
15 with the television program guide service). Use of electronic mail to remind users of program events which are in the current time frame is known (See, United States Patent Application No. 08/987,740, filed  
20 December 9, 1997, which is hereby incorporated by reference in its entirety).

If the user is browsing program listings from a computer located at the user's office, the user can wish to have notifications addressed to his home (i.e., using his personal Internet access account and the  
25 electronic mail address for the system at home). Alternatively, the user can wish to have notifications sent to an office electronic mail address. If the user has a common electronic mail address for both home and the office, notifications can be accessed at either  
30 location. If desired, the system can provide more than one field 418 (e.g., field 421) so that notifications can be sent to more than one electronic mail address.

Notification order display screen 410 of FIG. 19 can also provide several user-selectable

options that specify when and how often the user will be notified of the airing of selected non-frame television programs. For example, notification order screen 410 can contain notify me box 424. Selecting an option in notify me box 424 allows the user to specify how often the system will generate and send a notification to the user. As shown in FIG. 19, the options in notify me box 424 can allow the user to be notified of the selected program only once, each time the program is being broadcast, each time the program is broadcast in a month, or at some other specified time. If "other" in notify me box 424 is selected, the user can be presented with screen 510 shown in FIG. 20. Such options can be selected with a mouse, keyboard, or any other suitable interface device. Screen 510 allows a user to specify a time period during which notifications will be generated and sent. The user can specify a time period by entering information in box 513.

Notification order display screen 410 of FIG. 19 can also contain how soon box 430. Selecting an option in box 430 allows the user to indicate how soon before the broadcast of the selected program notifications are to be generated and sent to the user. As shown in FIG. 19, box 430 can contain options that allow the user to be notified 1 hour, 1 day, 2 days, or another predetermined period of time before the selected program is broadcast. If "other" is selected in box 430, the user can be presented with display screen 510 of FIG. 21, which allows the user to specify a desired lead time before a scheduled event by completing box 515.

Upon completing display screen 510 of FIG. 21, the user can submit the information that has

been entered by selecting enter button 517. The user can exit display screen 510 without submitting the information by selecting exit button 519. If the user selects either enter button 517 or exit button 519, the user can be returned to the previous screen, such as notification order display screen 410.

The options that the user selects in boxes 424 and 430 of order display screen 410 determine, respectively, how often and when notifications will be sent. For example, a user can select a program from coming soon program display screen 310 of FIG. 18B. When the user selects a program from display screen 310 of FIG. 18B, the user can be presented with order display screen 410 of FIG. 19. If the user selects the "1 hour" option in box 430 and the "each time being broadcast" option in notify me box 424, the user will receive notifications (assuming fields 414 and 418 are completed with the user's own information) 1 hour before each broadcast of the program.

At any time during the completion of notification order display screen 410 (FIG. 19), the user can cancel the notification order by selecting cancel box 480. Selecting cancel box 480 can return the user to display screen 310 of FIG. 18B. Upon completing order notification display screen 410, the user can submit a notification order for processing by selecting submit box 440.

FIG. 21 shows an illustrative electronic mail notification 600. Notification 600 can display electronic mail address 611 of the person to whom the mail is being sent, name 613 of the program for which the notification is being sent, and information on when the television program is to be broadcast. The user

can delete notification 600 by selecting delete button 618. An advertisement 620 (text, graphics, video etc.) can be included in or attached to the notification if desired. The advertisement can be  
5 provided using information stored in a remote or local database, such as databases 16, 24, or 36.

Notification 600 can also include interactive links to various screens and services, including, but not limited to a link to program guide display  
10 screen 218 and a link promotional offers that can or can not be interactive. When a user selects interactive options 625 and 626, program events can be automatically ordered/tuned, or recorded. If desired, these options can be automatically removed from the  
15 notification after being selected by a user to reduce clutter on the notification. The options can also be automatically removed after a predetermined period of time following a particular event. A particular event can occur (1) when data regarding the program is  
20 received by a local database, (2) when data regarding the program is received by a remote server, or (3) when the user is notified.

Another aspect of the invention relates to management of one's notifications. If desired,  
25 notification order display screen 410 of FIG. 19 can contain view current box 483. If view current box 483 is selected, the user can be presented with illustrative current notifications display screen 710 of FIG. 22. Another way that the user can reach  
30 current notifications screen 710 of FIG. 22 is by selecting view current notifications button 233 in display screen 218 of FIG. 18A. Current notifications display screen 710 contains a list of all the user's currently requested notifications. Information, such

as the program name, type of notification, and the date and time submitted can be displayed.

FIG. 22, shows an illustrative example of a current notification entry for the program "Primal Fear". This notification was submitted by the user on November 1, 1997 at 3:03 p.m. and is set to notify the user one hour before each broadcast. Entries can be added to the current notification list as soon as the user sets a new notification (e.g., by selecting submit button 440 from order notification screen 410 of FIG. 3). When an item in list is selected (e.g., positioning a highlight region on an item and pressing a data entry key), display screen 410 of FIG. 19 can be displayed to allow the user to modify the notification configuration for the selected item in the list. If desired, the user can be provided with the opportunity to change the configuration for an item in the list from the same display screen, display screen 710. An item can be removed from the list (e.g., by positioning a highlight region on an item and selecting cancel 712).

Another component of display screen 218 is new notifications box 231. New notifications box 231, which can be adjacent to the program navigation controls of display 218, allows the user to order notifications without using program listings 220. If new notifications box 231 is selected, the user can be presented with illustrative new notifications display screen 810 of FIG. 24.

New notifications screen 810 contains user-selectable options similar to the options contained in notification order display screen 410 of FIG. 19. For example, new notifications display screen 810 contains user information box 813, how soon box 830, and notify me box 824. However, new notifications screen 810



allows the user to enter the title of a non-frame television program.

If the user does not enter the exact title of the non-frame television program in new notifications display screen 810, the data in the database 16, 24, or 36 or any other suitable set of television program listings data can be scanned to find the program or programs that most closely match the program title indicated by the user. If several matches are found, a list of the program matches can be presented to the user and the user can choose the actual program desired. Once the user has chosen a program from the list, the program title in box 818 can be automatically updated. If no matches are found, or if the user does not accept one of the offered choices, the title can be left as entered.

A user can exit new notifications display screen 810 at any time by selecting exit button 880. Selecting exit button 880 can return the user to display screen 218 of FIG. 18A.

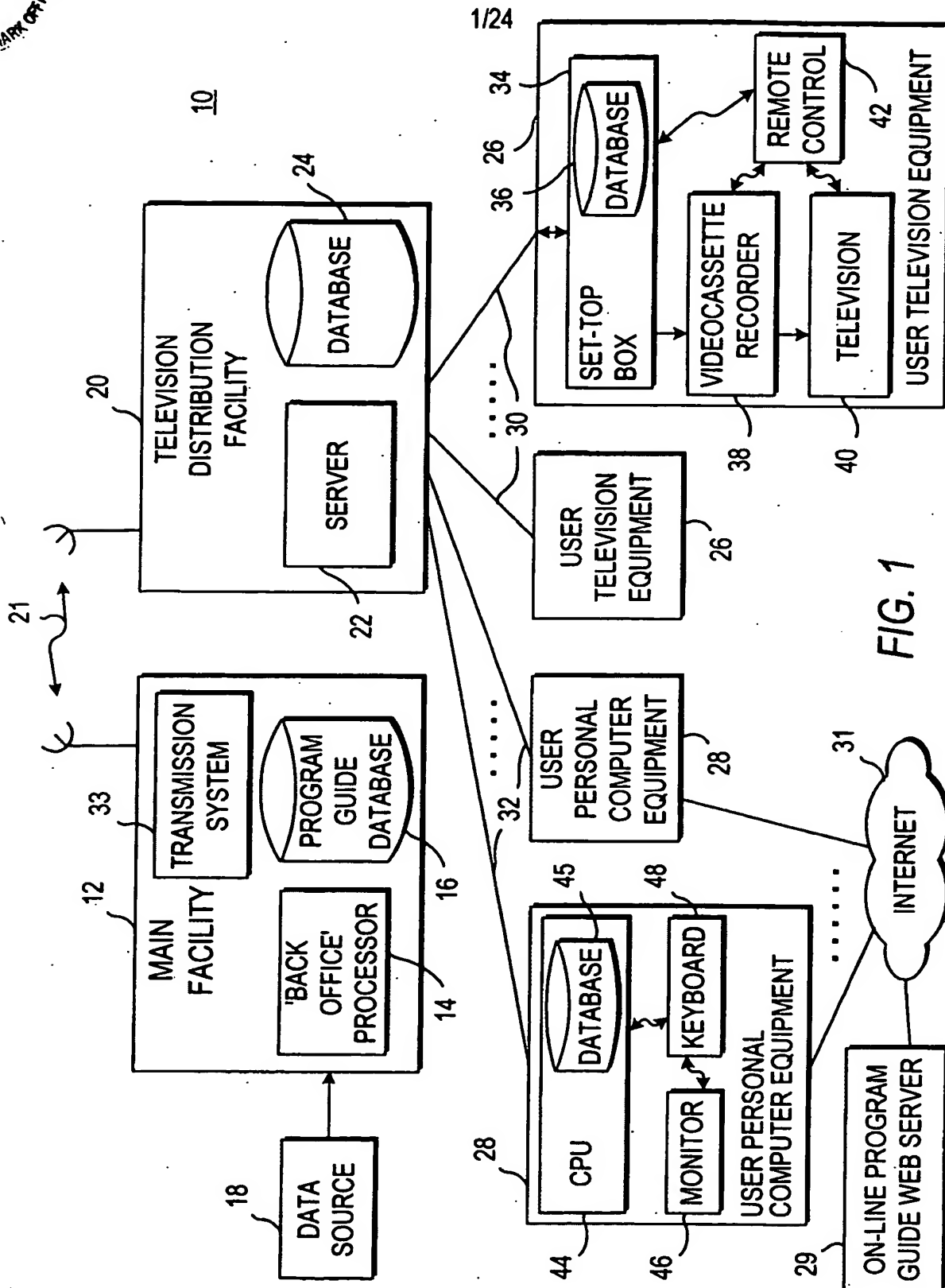
Upon completing new notifications display screen 810, the user can submit the notification order for processing by selecting submit box 840. Selecting submit box 840 allows program guide system 10 (FIG. 1) to process the request. The request can be processed in the same way a notification request can be processed when ordered from notification order display screen 410 of FIG. 19.

The user can reach current notifications display screen 710 of FIG. 22 from new notifications display screen 810 of FIG. 23 by selecting view current notifications button 883.

The foregoing is merely illustrative of the principles of this invention and various modifications

can be made by those skilled in the art without  
departing from the scope and spirit of the invention.

000000-000000





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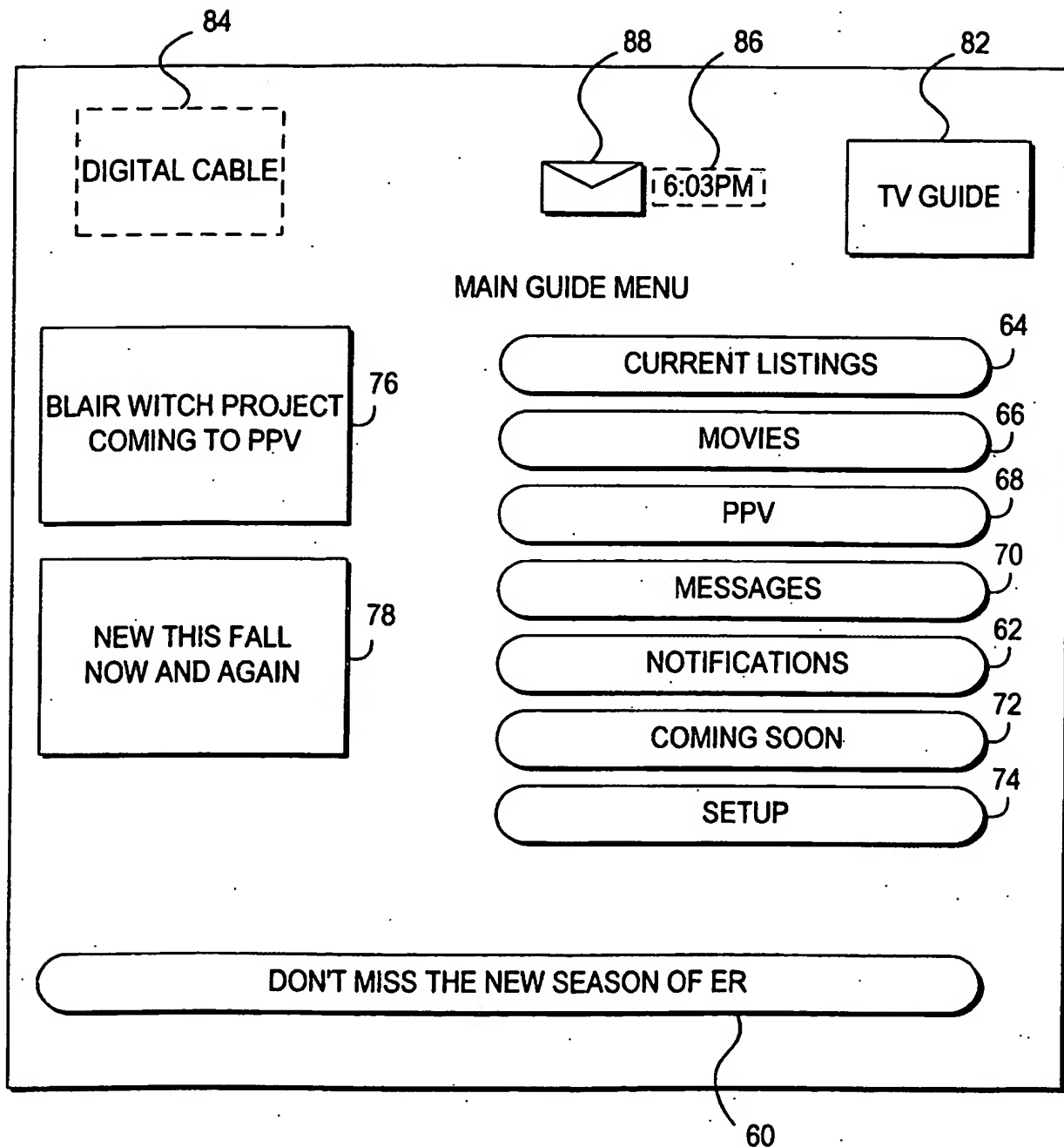


FIG. 2



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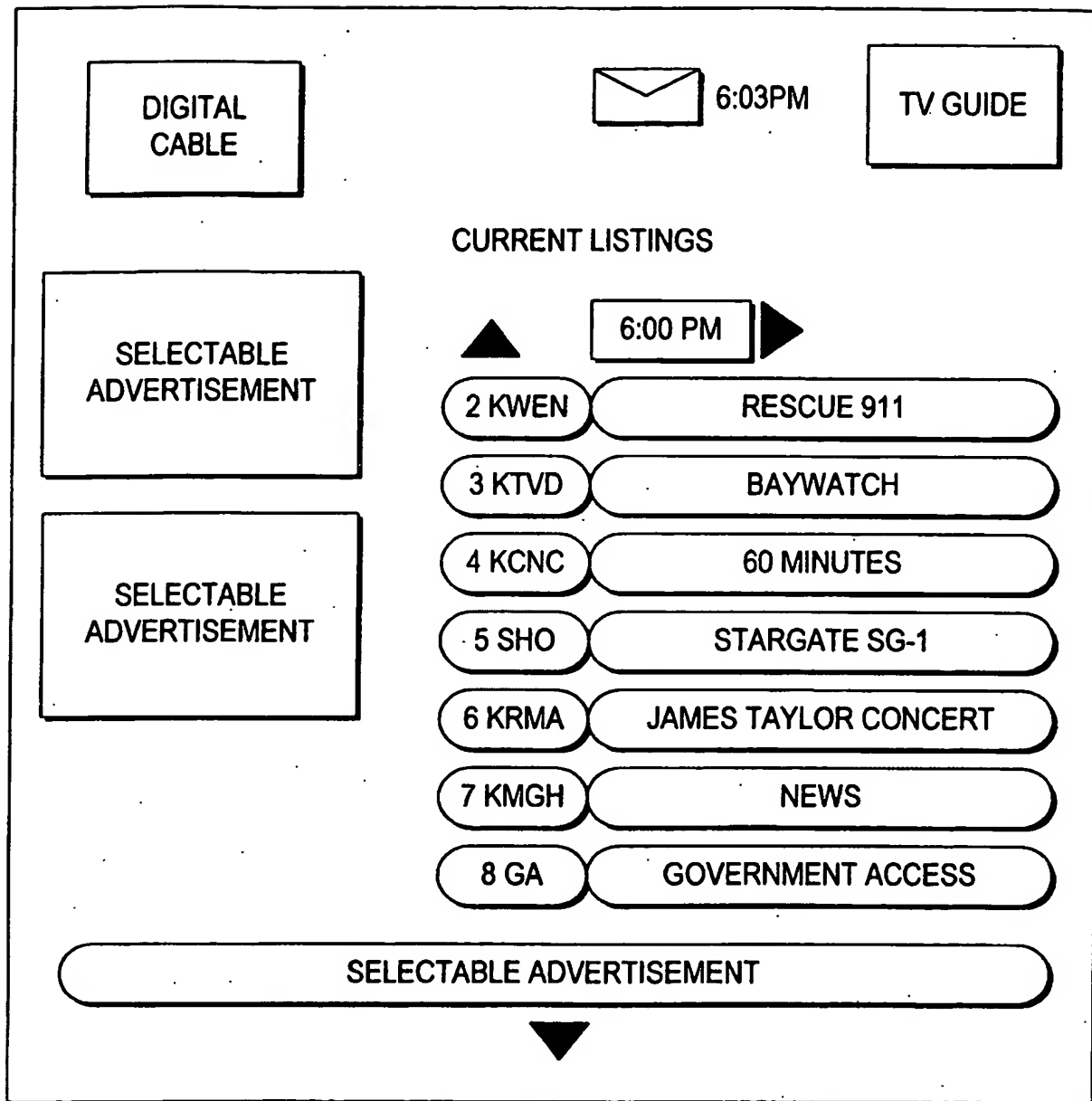


FIG. 3

90



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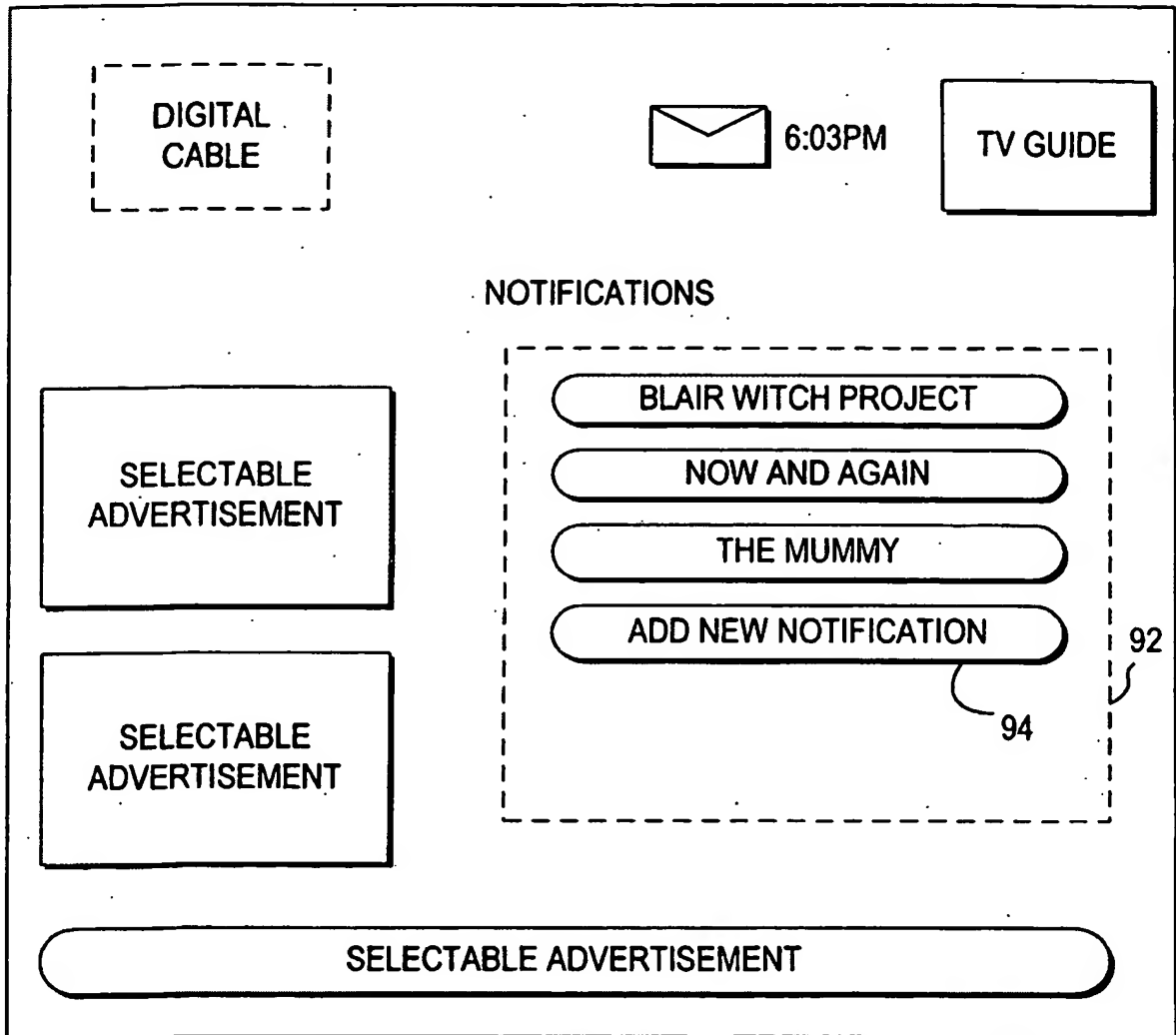


FIG. 4

90



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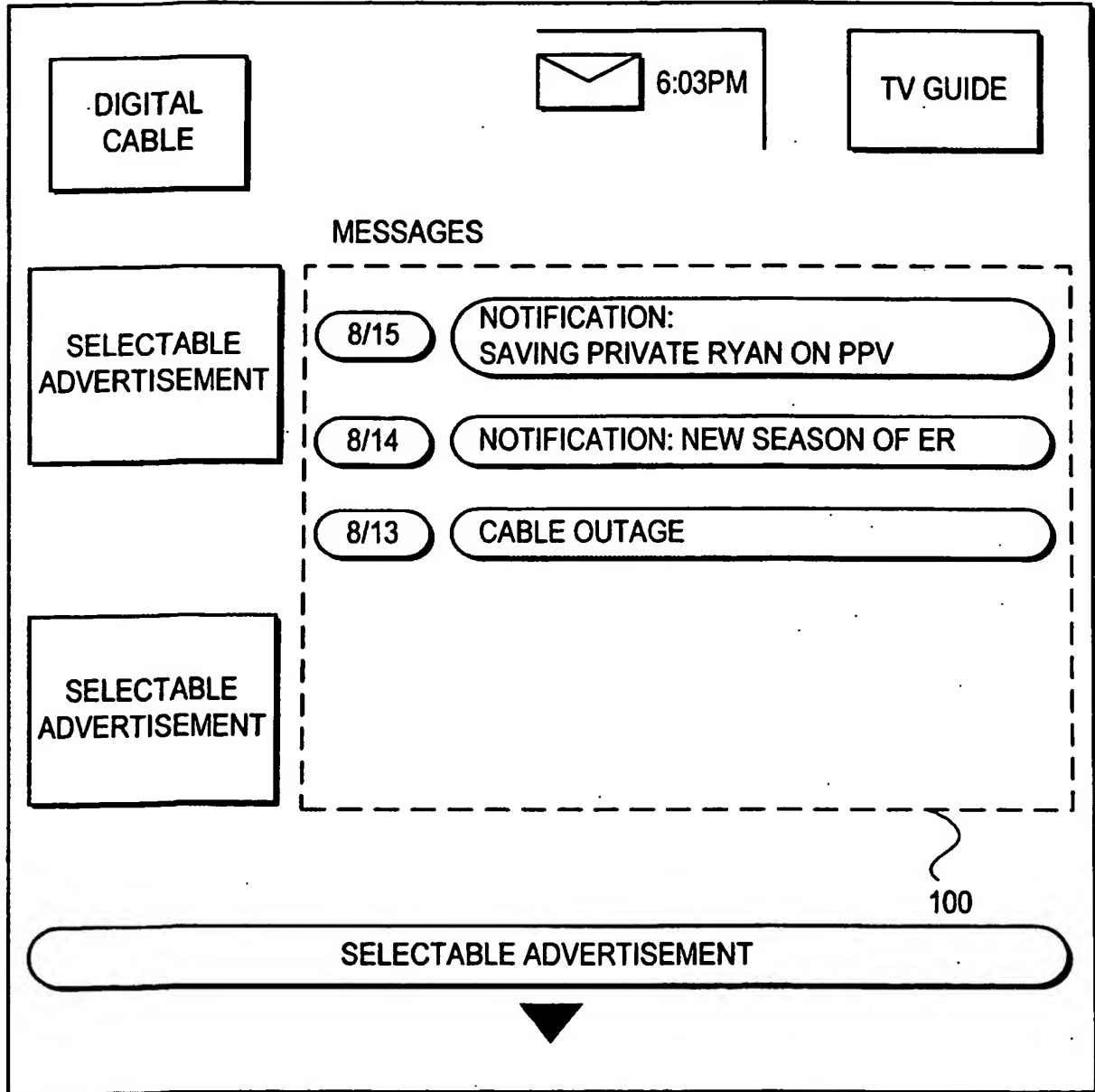


FIG. 5

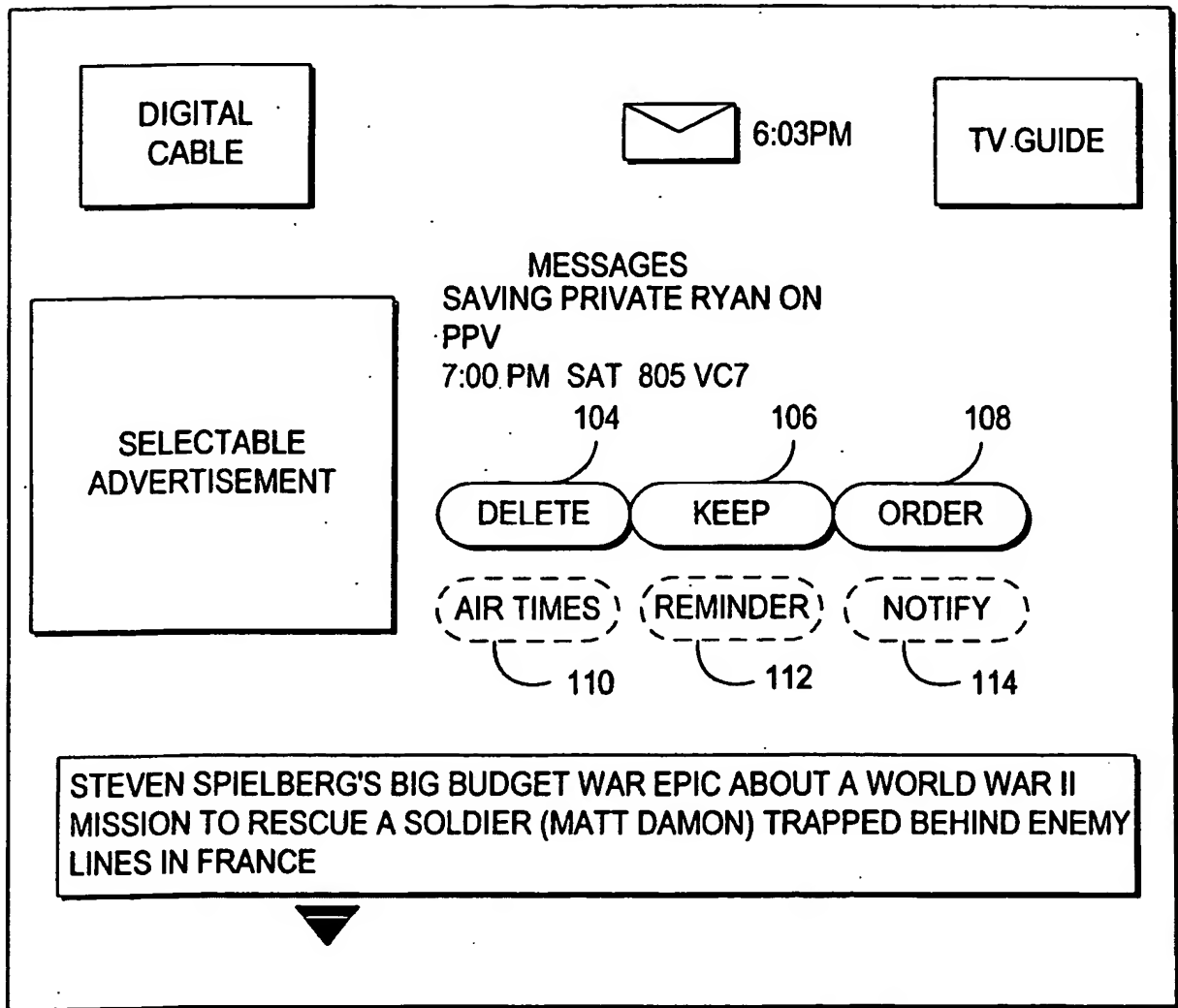


FIG. 6



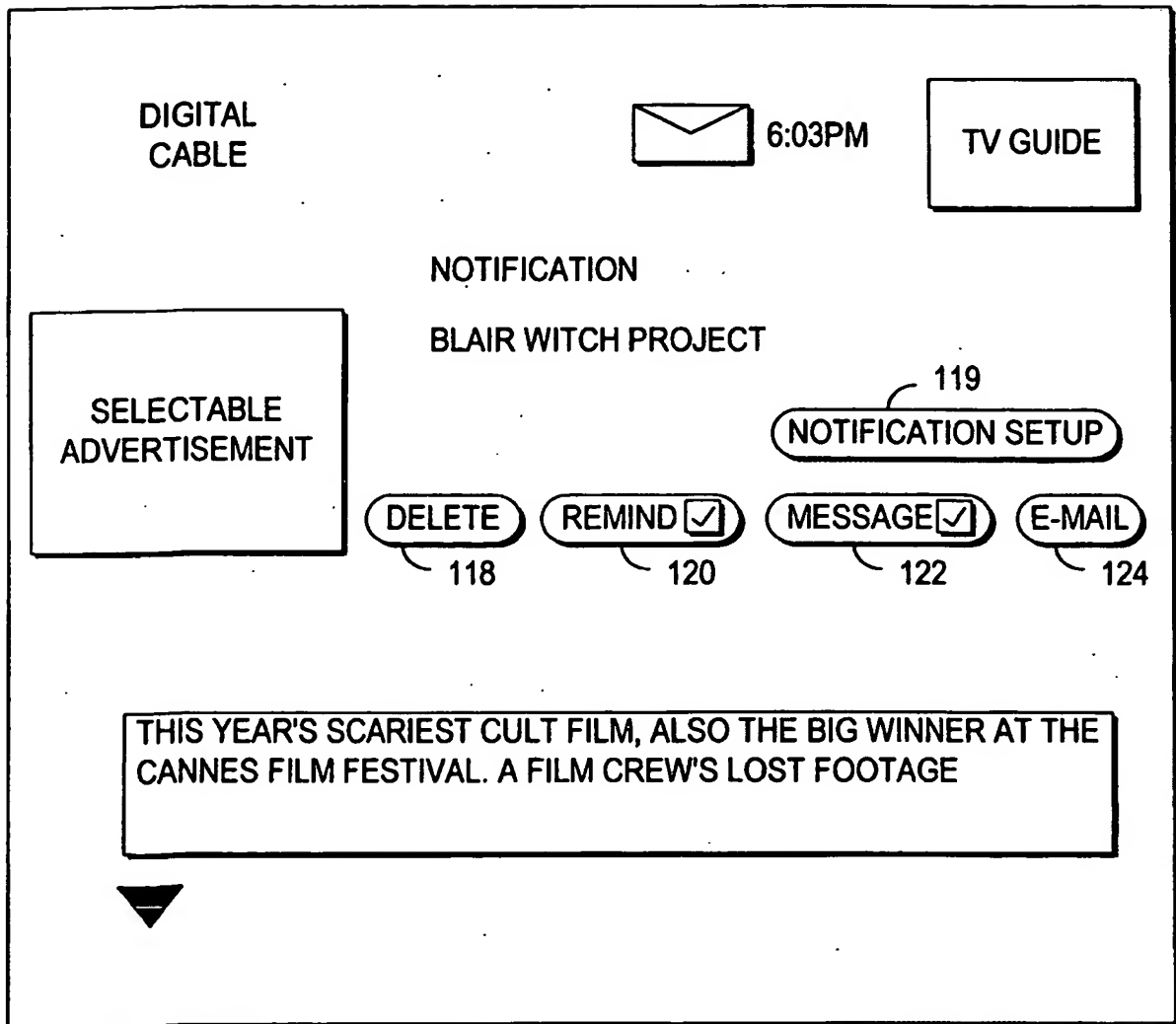



FIG. 7



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DIGITAL CABLE

 6:03PM

TV GUIDE

SELECTABLE ADVERTISEMENT

REMINDER (SET OR DELETE)

BLAIR WITH PROJECT

WOULD YOU LIKE A REMINDER WHEN THIS PROGRAM IS ON TELEVISION?

YES NO

THIS YEAR'S SCARIEST CULT FILM, ALSO THE BIG WINNER AT THE CANNES FILM FESTIVAL. A FILM CREW'S LOST FOOTAGE

▼

FIG. 8

126



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DIGITAL CABLE

6:03PM

TV GUIDE

MESSAGE (SET OR CANCEL)

BLAIR WITH PROJECT

WOULD YOU LIKE A MESSAGE SENT TO YOU  
BEFORE THIS PROGRAM IS ON TELEVISION?

SELECTABLE  
ADVERTISEMENT


YES NO

FIG. 9



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DIGITAL CABLE

 6:03PM

TV GUIDE

SELECTABLE ADVERTISEMENT

E-MAIL  
BLAIR WITH PROJECT  
WOULD YOU LIKE AN E-MAIL MESSAGE  
WHEN THIS PROGRAM IS SCHEDULED TO BE  
SHOWN ON TELEVISION?

YES NO

ENTER YOUR E-MAIL ADDRESS

FIG. 10

130



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DIGITAL CABLE

6:03PM

TV GUIDE

NEW NOTIFICATION

ENTER THE TITLE:

SELECTABLE ADVERTISEMENT

REMIND MESSAGE E-MAIL ☒

FIG. 11

132



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# TELEVISION VIDEO

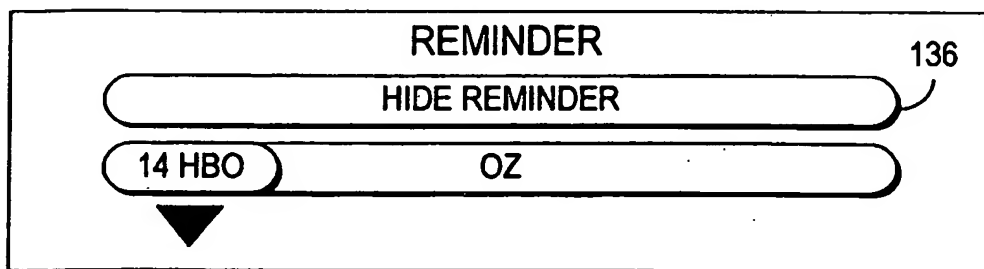
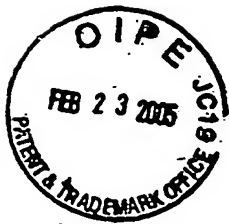


FIG. 12

134



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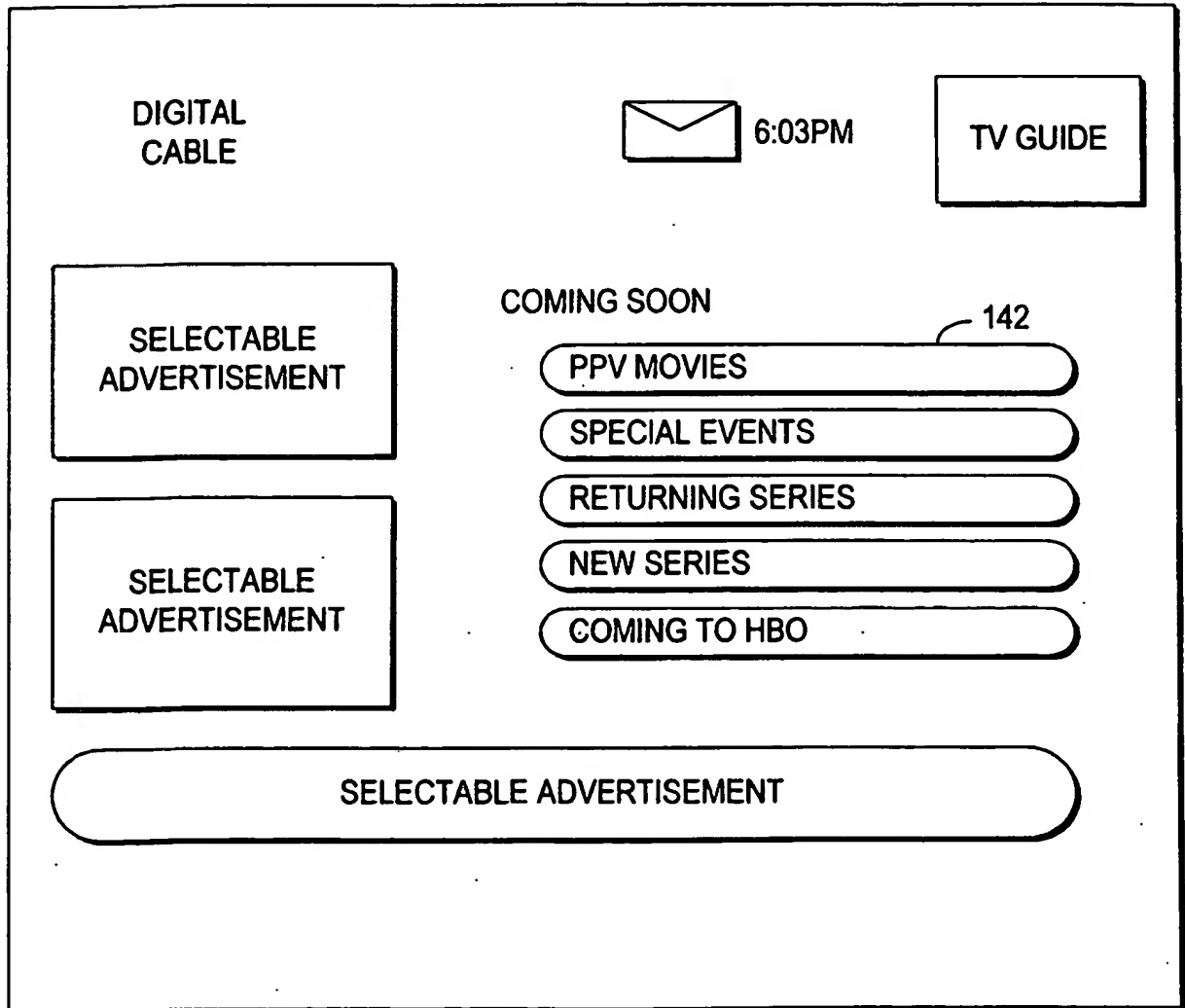


FIG. 13

140



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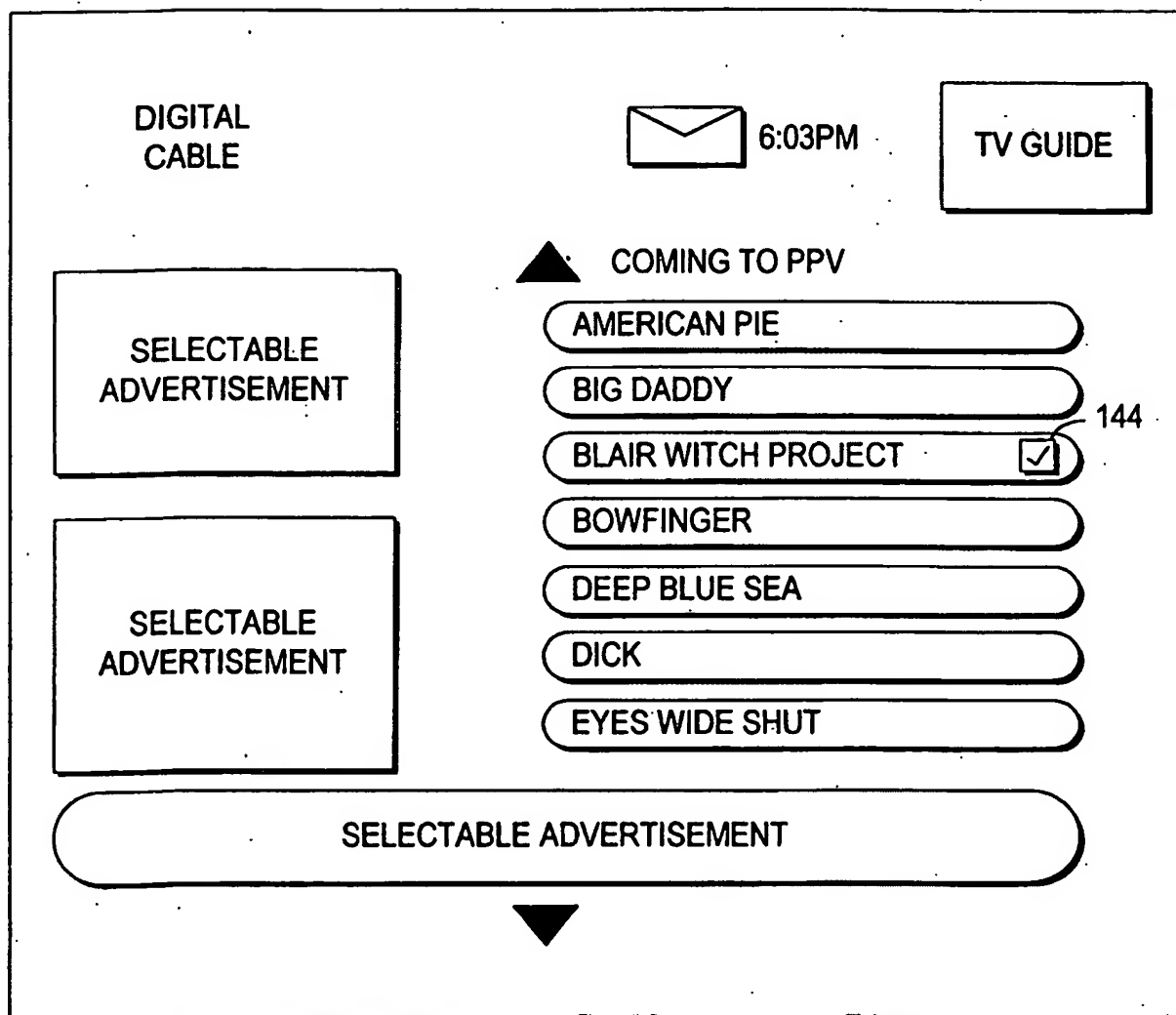


FIG. 14

138





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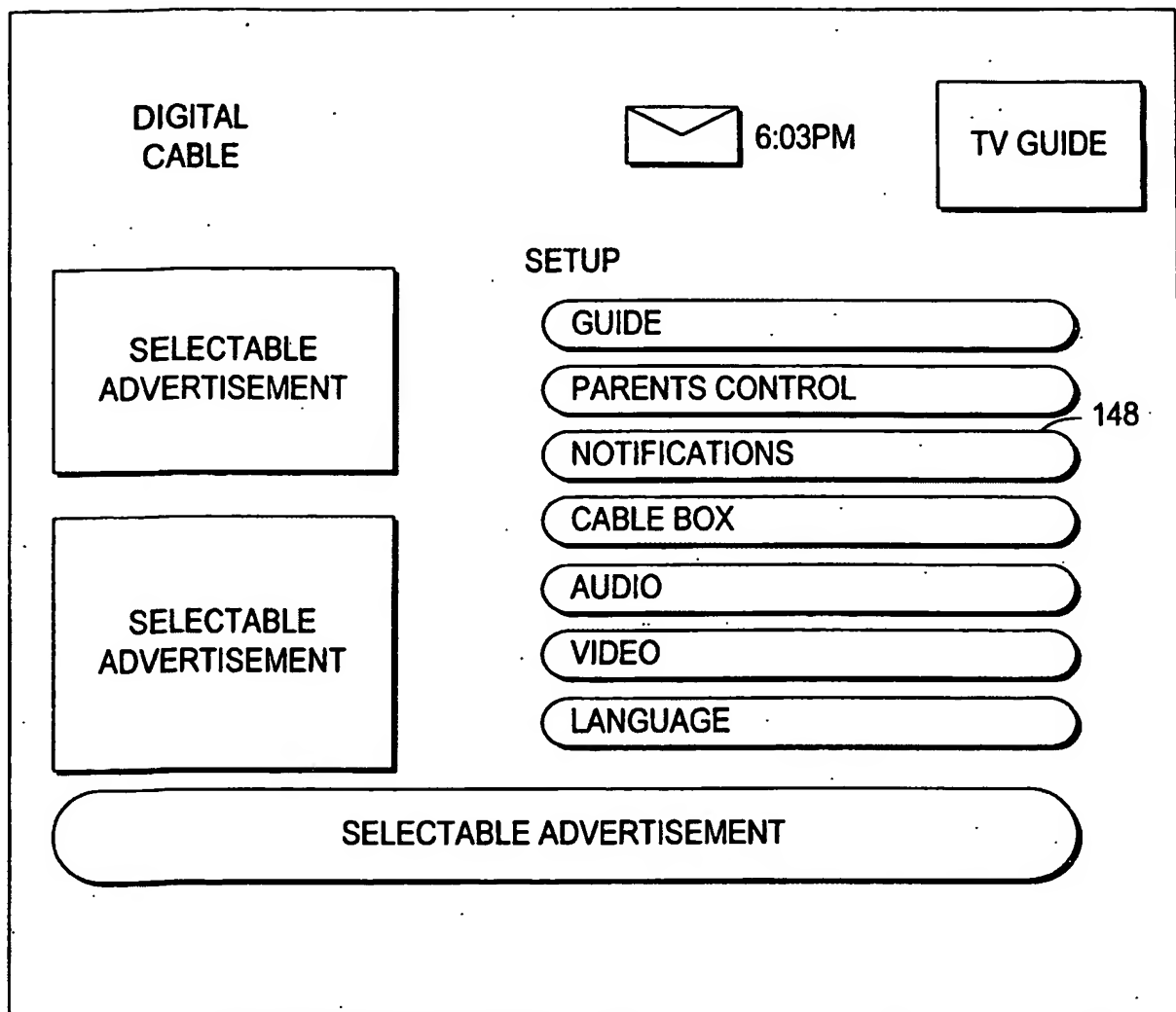


FIG. 15

146



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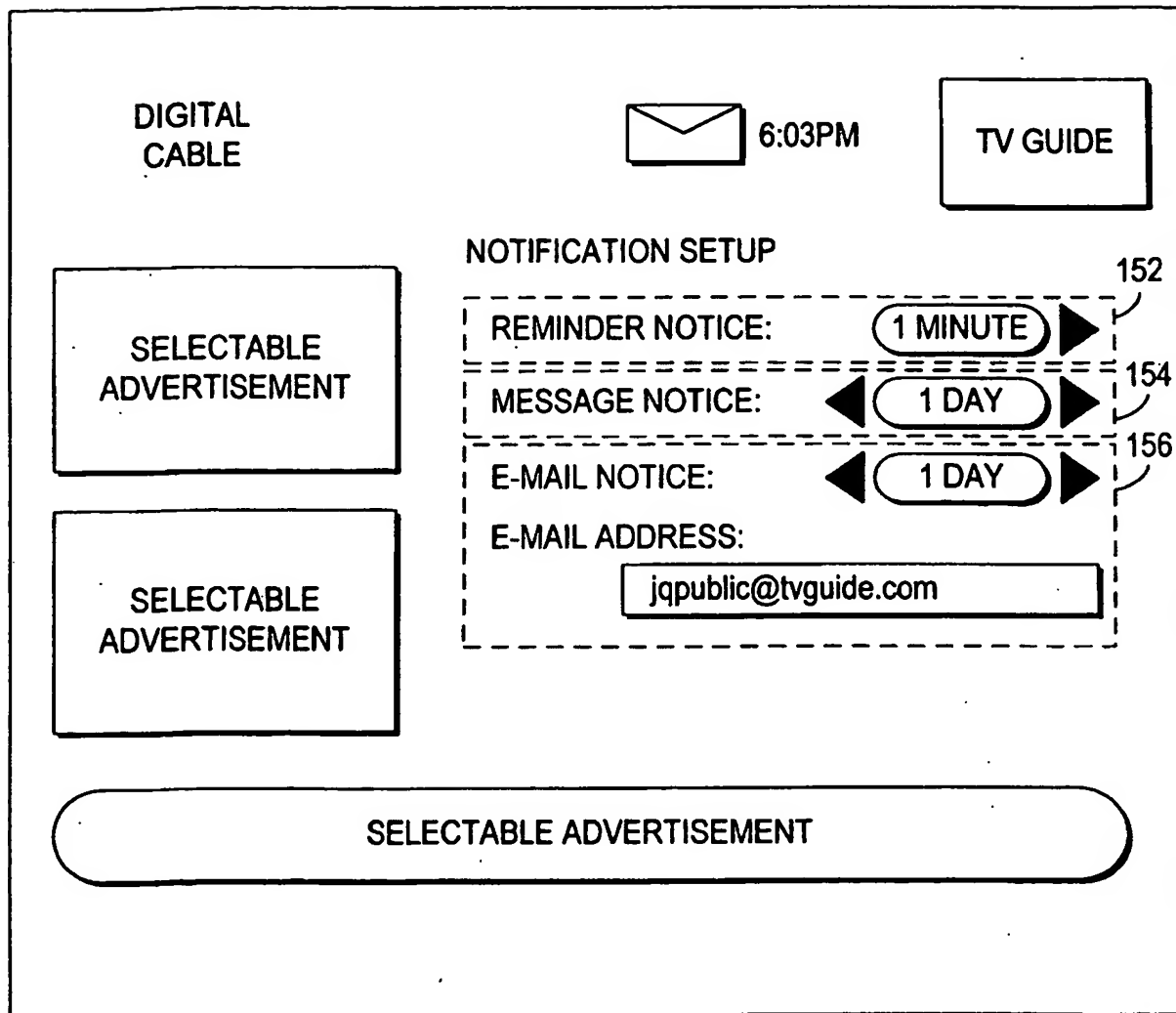


FIG. 16

150



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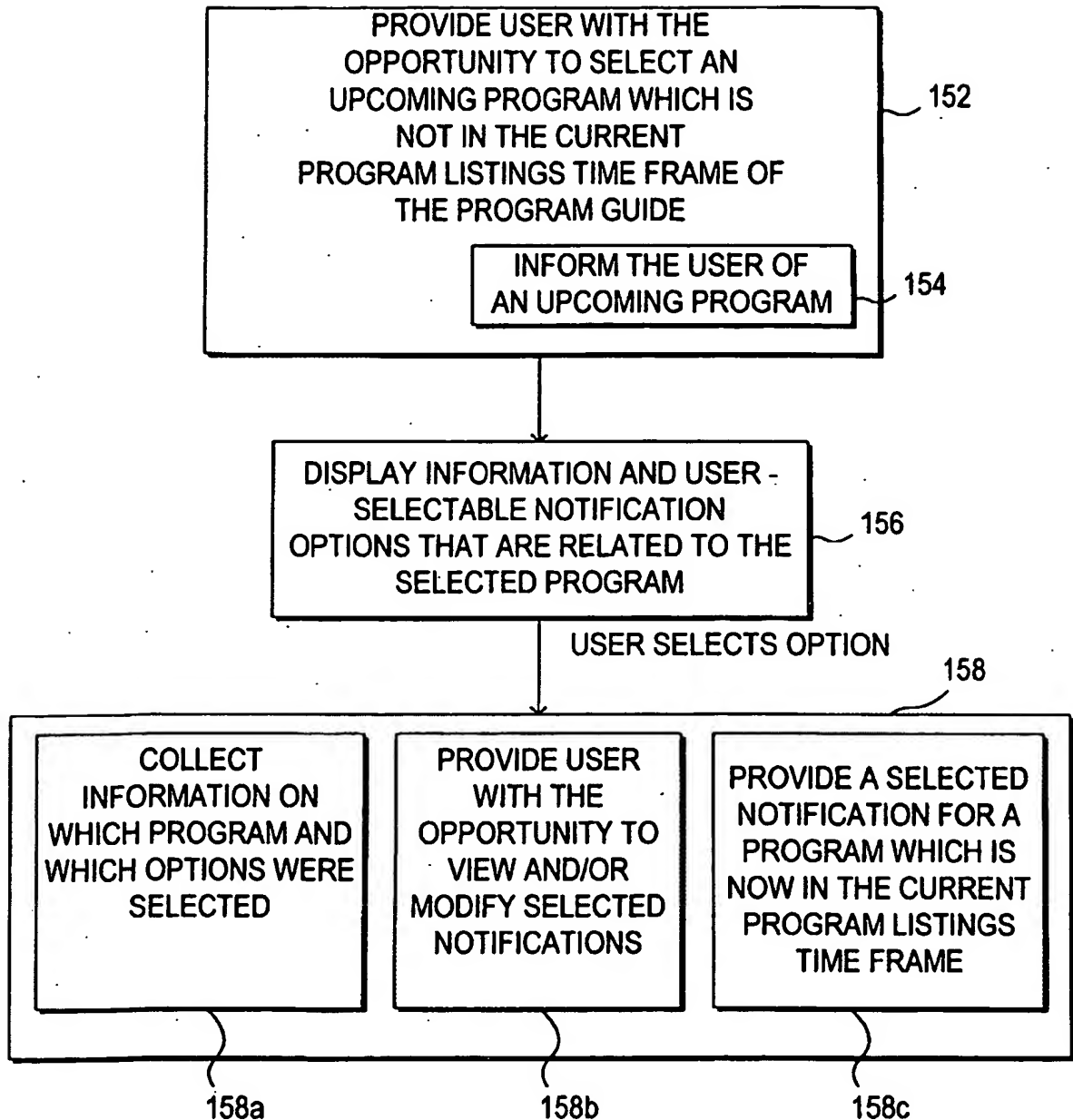


FIG. 17

Applicants: McKissick et al. EXPRESS MAIL NO. EV615578803US  
Docket No.: UV-98 Filed: August 20, 1999  
For: ELECTRONIC PROGRAM GUIDE WITH ADVANCE NOTIFICATION  
Attorney: Evelyn C. Mak Reg. No. 50,492 Confirmation No.: 9255  
REPLACEMENT SHEET

**FIG. 18A**

PREVIEW

TCI

Gillette

SAT 7

1:30PM

2:00

2:30

3:00

2 KCBS	COLLEGE FOOTBALL ARMY VS. NAVY	COLLEGE BASKETBALL KANSAS AT UCLA		
4 KNBC	COLLEGE BASKETBALL JOHN WOODEN CLASSIC -- ARIZONA VS. UTAH		COLLEGE BASKETBALL	
5 KTLA	SYLVESTER & SAVED BY BELL	COLLEGE	CALIFORNIA DREAMS	
6 ESPN	GOLF		PGA GOLF	
7 KABC	COLLEGE FOOTBALL BIG 12 CHAMPIONSHIP -- TEAMS TO BE ANNOUNCED			
9 KCAL	PAID PROGRAM	HITCH HICKER	MAGIC OF CHRISTMAS	
10 CNN	YOUR MONEY	COMPUTER CONNECTION	MONEYWEEK	INSIDE BUSINESS
11 KTTV	WMAC MASTERS	WCW WORLD WIDE WRESTLING		
12 MTV	REAL WORLD	REAL WORLD	REAL WORLD	REAL WORLD
13 KCOP	PAID PROGRAM	PRIMAL FEAR		
15 FOXA	TENNIS	WOMAN'S COLLEGE SOCCER		

SELECT DAY TO VIEW

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21

SELECT TIME OF DAY

EARLY	MORNING
MID-DAY	AFTERNOON
PRIME TIME	LATE NITE

CURRENT

NEW NOTIFICATIONS

VIEW CURRENT NOTIFICATIONS
USER PREFERENCE PROFILE

COMING SOON

PROGRAM SCREEN



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FIG. 18B

310

COMING SOON PROGRAM SCREEN	
TITANIC	312
THE GENERAL	
SAVING PRIVATE RYAN	
* RUSHMORE	

FIG. 19

410

413

<p>ENTER NAME: <input type="text"/> 414</p> <p>ENTER E-MAIL: <input type="text"/></p> <p>ADDRESS: <input type="text"/> 418</p> <p>ADDRESS 2: <input type="text"/> 421</p>			<p>424</p>	
<p>HOW SOON BEFORE EVENT DO YOU WANT TO BE NOTIFIED?</p> <p> <input type="radio"/> 1 HOUR  <input type="radio"/> 1 DAY  <input type="radio"/> 2 DAYS  <input type="radio"/> OTHER         </p> <p>440</p>			<p>480</p>	
<p>SUBMIT</p>		<p>CANCEL</p>		<p>VIEW CURRENT NOTIFICATIONS</p>
<p>NOTIFY ME:</p> <p> <input type="radio"/> ONCE ONLY  <input type="radio"/> EACH TIME BEING BROADCAST  <input type="radio"/> EACH TIME THIS MONTH.  <input type="radio"/> OTHER         </p>				

430



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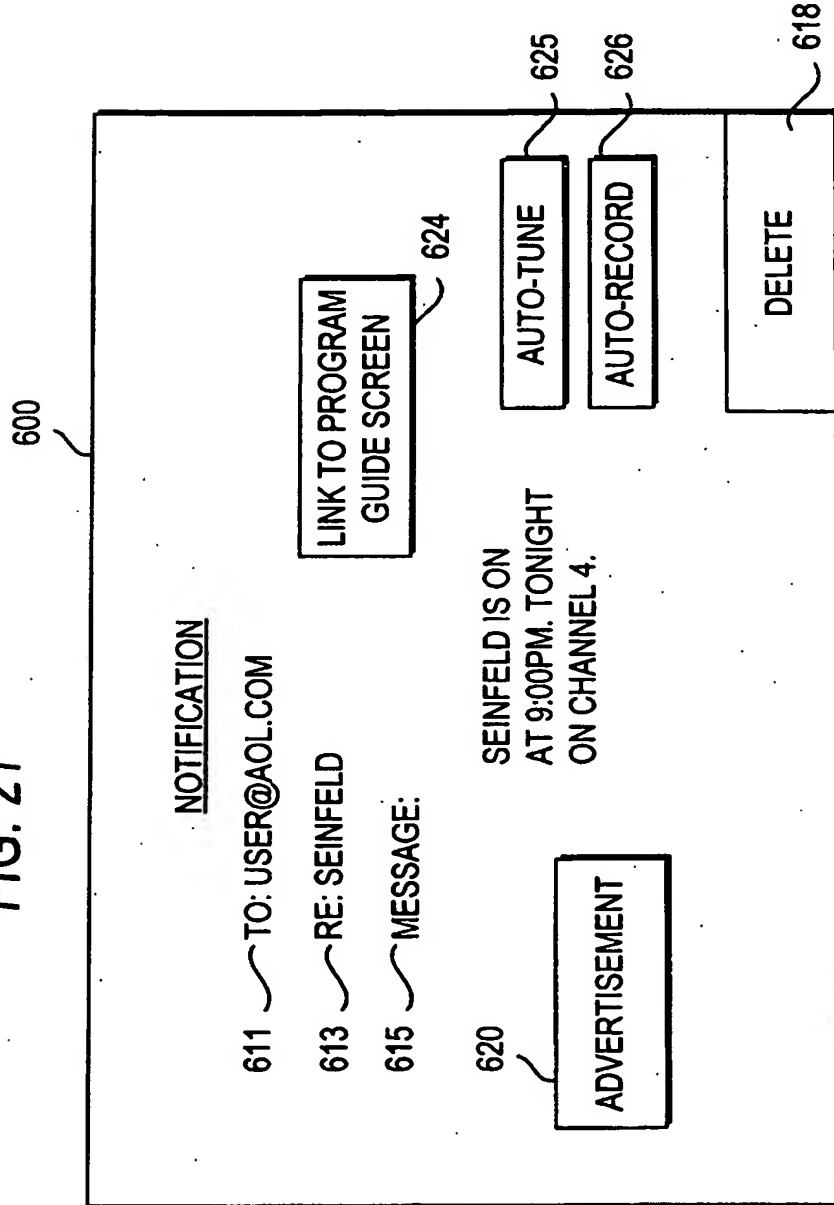
FIG. 20

510		513	
NOTIFY, ME EACH TIME:			
FROM:		TO:	
DATE: _____	DATE: _____		
TIME: _____	TIME: _____		
<hr/>			
HOW SOON BEFORE EVENT DO YOU WANT TO BE NOTIFIED?			
DAYS: _____			
HOURS: _____			
MINUTES: _____			
		ENTER	EXIT
		519	
517			



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FIG. 21









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FIG. 23

810

NEW NOTIFICATIONS	
<div>813</div> <div>ENTER NAME: ENTER E-MAIL ADDRESS:</div>	
<div>818</div> <div>ENTER PROGRAM TITLE:</div>	
<div>824</div> <div>NOTIFY ME: <input type="radio"/> ONCE ONLY <input type="radio"/> EACH TIME <input type="radio"/> EACH TIME THIS MONTH <input type="radio"/> OTHER</div>	
<div>830</div> <div>HOW SOON BEFORE EVENT?: <input type="radio"/> 1 HOUR <input type="radio"/> 1 DAY <input type="radio"/> 2 DAYS <input type="radio"/> OTHER</div>	
<div>840</div> <div>SUBMIT</div>	<div>880</div> <div>VIEW CURRENT NOTIFICATIONS</div>
<div>883</div> <div>EXIT</div>	